COAL AGE

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Motion Studies Applied to Coal Mining

Since Taylor, Gilbreath, Brandies, and others have written on the above subject, or "Scientific Management" as it is more familiarly known, much benefit has been derived from its application and much harm caused by a misunderstanding of the problems involved.

The average workman understands that by "Scientific Management" we propose to teach him how to lift 100 lb. of pig iron, or other material, in such a way that it will not feel any heavier than if he were lifting only a few pounds of material, and he, knowing that such a thing is absurd, very roundly denounces "Scientific Management" as a myth.

Perhaps a better definition of "Motion Study" would be to say that it is the application of common sense to industry rather than the more common practice of forever following tradition.

Not long since there was gathered round the tables of a banquet hall many mining men of experience in their particular branches of industry; a professor of mining engineering in one of our prominent universities was present, and asked the question whether or not efficiency engineering could be applied to advantage in coal mining. One engineer, who had made some motion studies in coal mining, and who had increased the efficiency of hoisting over 260 per cent. in one instance, was alone in his opinion that such a science could be employed to advantage in mining coal.

Perhaps no great industry in the country has shown less advance in the last 100 years than coal mining. For example, the miner of today in the anthracite field, cuts, shoots and loads his coal practically in the same way as did his father or grandfather.

How many operators are there who can give a lucid and sufficient reason for the details in the cycle of operations that have to do with getting the coal from the working face to the railroad car? Are all of the men, animals, material and energy employed to the best advantage of everybody concerned, and is there any lost motion? Can anyone with truthfulness answer the above question in the affirmative for any one mine in any field in the country? Is any man, animal or machine going through useless motion and if so, why? Can any one give the reason why, or why not, an 18-ft. room under given conditions is better than a 14-ft. room, or a 24-ft. room, or no room at all?

Mr. Operator, do you think you are treating your labor in such a way as to remove the present industrial unrest or to increase the present dissension existing when you ask a miner to go into the mines at 7 a.m., shoot his cut, timber his place, clean his coal, load the car that you give him at 8 or 9 o'clock, and load it quickly so that he becomes wet with perspiration, and then not give that miner another car until 12 or 12.30 p.m., or later; because perchance your haulage motor had to chase off to several other sections of the mine?

Do you think that you are working that miner to your best advantage, or his best advantage, and do you feel that while he is sitting on the "parting" wet from perspiration and cold from the swiftly moving current of air, which alas! often does not move at all at the working face, do you think that this group of coal loaders, waiting for a car, have kindly thoughts of you? Do you realize that on an average, as determined by observation, 72 per cent. of a coal-loader's time underground is lost in waiting for empties.

Is the plan of development in your mine such that you can concentrate your workings to the utmost, or does the mine's ramifications extend over 500 acres for a petty output of 500 tons and are you leaving 500 acres of pillars as you go? Is your plan of mining such that the further you go, the more scattered become your workings, or do the miners' working places bear a constant relation to one another?

The writer who has made motion studies of the above cycle of operations, i. e., getting the coal from the face to the railroad cars, ventures the assertion that not only are the present plans of development extravagant of capital, men, material and the natural coal resources, but that there is hardly a motion in the entire cycle that cannot be improved upon, and that a large percentage of same can be entirely eliminated, resulting in decreased cost to the operator and increased earnings to the miner.

Make motion studies of the cycle of operations yourself, forget tradition, apply common sense, and you will become appalled at the extravagance of present methods.

Systematic Timbering and Mine Fatalities

SYNOPSIS—The British Columbia Mining Department has issued a set of rules to govern the placing of all timbers in underground workings. It is hoped that the scheme of enforcing a systematized plan of timbering will reduce the accidents from roof falls.

Loss of life, largely unnecessary, is witnessed each year through faulty or inadequate timbering at the working faces of our coal mines.

British Columbia, spurred by the unwarranted increase in such fatalities during the past year, has taken a decisive step toward eliminating, or, at least, minimizing this danger, in the adoption of a "Special Rule—Systematizing Timbering."

This rule was referred to the mine managers of the province last year in a circular, sent out by the Chief Inspector of Mines at the direction of the Minister of Mines, which was, in substance, as follows:

"For a number of years past, the percentage of fatal accidents from falls of roof and coal at the working faces, has ranged from 35 to 60 per cent. of the total accidents occurring in coal mines. I regret to say that, during the first five months of the present year, there have been 12 fatal accidents—or three more than during the whole of last year—from these causes.

"Owing to the large increase in this class of accidents, the Minister of Mines deemed it necessary to avail himself of the powers given him, as set forth in Sec. 101 of the Coal Mines Regulation Act, and proposes in writing to the managers of the various collieries, a special rule, covering the question of systematic timbering and spragging at the working faces.

"Recognizing that, owing to the widely varying conditions in the different collieries in the province—even in the same field, and often in the same mine—that a hard-and-fast rule on systematic timbering would render such rule often impracticable, making the same invalid and often, even tending to bring about the very conditions it would be aimed to prevent; therefore, before formulating any such rule, the Minister, in keeping with his former policy, would like to avail himself of your assistance and coöperation in this very important matter, so the following proposed special rules are submitted for your consideration."

Special Rules for Systematic Timbering

(A) The manager of the mine shall cause to be posted, at a conspicuous place, near the mouth of the mine, a notice stating the minimum size of the different types of timber to be used in such mine, and the maximum distance between timbers, and between the timbers and the face and sides of the working face.

(B) In the event of two or more methods of timbering being used in one mine, then, in addition to the notice posted at the mouth of the mines, the notice shall be posted at the entrance, to each section or district, stating the method of timbering to be used in such section or district of such mine.

(C) It shall be the duty of the miner in charge of a working place—which shall include such working place and for a distance of 15 ft. back from the face—to keep the props, timbers, or other roof supports erected as designated in the notice of systematic timbering governing the mine, division, or sub-division of such mine in which he is employed.

(D) Nothing in this section shall prevent a miner from setting supports, or an official from requiring the miner to set supports in his working place at more frequent intervals than those specified in the notice aforesaid, if necessary for safety.

(E) Every miner in charge of a working place, shall set sufficient sprags or other supports for the undermined coal, provided that before commencing to mine, he shall set one sprag or other support, and not less than one for every six feet of such undermining.

(F) Temporary props shall only be withdrawn by use of a dog and chain or othr type of timber-drawing machine, unless permanent timber has been set before such withdrawal, and no permanent prop, timber, or other roof support shall be finally withdrawn without the use of such timber-drawing device.

The large majority of the managers in the province heartily approved the Minister's suggestions and all, with the exception of two or three, who have since complied, were in a position to start the present year under a method of systematic timbering.

The special rule, as finally adopted, is uniform throughout the province; the method of timbering under the rule having been provided for, to suit the local conditions of each mine affected.

The adoption of this rule is undoubtedly a step in the right direction, and the records of British Columbia for the current year should most certainly prove its justification.

Excerpts from Advanced Sheets of Penn. Bituminous Report, 1913

The following extracts taken from the forthcoming report of Mine Inspector Charles P. McGregor are worthy of careful attention:

Accidents—The responsibility for preventing accidents falls upon both the mine officials and the employees and if they would do their clear duty there would soon be a happy change.

Equipment—Even where many improvements (in the mine equipment) are in place, we too often find, in the mine, that brattices and doors are begrudged, roads badly kept; while a cheap, hard-worked mine official either wades contentedly in and out through mud and water or vainly strives to keep up a show of good order and repairs. But just as soon as operators supply thoroughly reliable plants and machinery and insist on everything being kept in proper order and repair underground as well as on the surface good results will be shown financially.

Certification—A good engine or electric motor is more easily obtained than a good mine foreman. * * * Many a worthy man is turned down, who though he can manage a mine cannot write out an examination paper; while another, whose whole experience has been gained as a miner, mining engineer or man of general work inside of the mine has, by night study and self-education, so improved his mind that he has been enabled to secure a mine foreman's certificate. In making an examination

imperative the law has done all it should do in the matter and it now rests with the Examining Board to carry on the work from this point. * * * There should be on our statute books an imperative law requiring a mine superintendent to hold a certificate of competency as well as the mine foreman.

The Superintendent—To secure an efficient superintendent or mine foreman a good salary should not be denied, and many coal companies have made large advances in recent years in this respect. The increased responsibility put upon mine officials renders this absolutely necessary and such encouragement leads capable young men to seek the office. Employers, however, might urge and encourage their officials not to be content with a certificate of competency, but to press on ever to higher and deeper knowledge in their profession and as a body they might institute other examinations in theoretical and practical mining, wherby real merit would be discovered and a higher order of certificates awarded.

Education of Workmen—The ignorant will always be thoughtless and

"The evil wrought by want of thought"

in our mines is but too amply seen in the list of fatalities by falls of slate and coal, mine cars and explosions of firedamp.

Many companies have already established well equipped evening schools. There should be on our statute books a compulsory education act compelling all boys from 14 to 18 years of age to attend evening schools.

Discipline—Hurry and confusion inevitably lead to accidents. Order and safety generally go together. Repairs put off or carelessly performed jeopardize the lives and limbs of the men, and the mine officials in charge should have a quick eye to detect flaws and adopt improvements as they appear. Neither personal talent nor energy will compensate for the want of discipline. Rules and laws must not be merely printed but obeyed. * * * It is not possible to estimate the value of discipline too highly. It is a most important element of success. The men, both young and old, should have this constantly impressed upon them. The special and general rules should be read and explained to them regularly and the conduct of the subordinate officials as to sobriety and punctual attendance to duty should be constantly observed and properly regulated.

You Can't Afford to Miss Our Next Issue

COAL AGE next week will contain a number of articles of great interest and value to every coal-mining man. First there will be a description of one of the largest retort-oven installations in England, with interesting notes relative to the advantages of the "Koppers" process. Then there will be a description of an uptodate coal plant in Virginia. Next will be an article on the prevention of coal-dust explosions, giving the most recent recommendations of noted British authorities on the subject of applying stone dust. Following that you will find an article on the construction of workingmen's houses. This article describes the introduction of hollow-tile for building miner's houses at the L. C. & N. Co.'s Hauto plant in Pennsylvania.

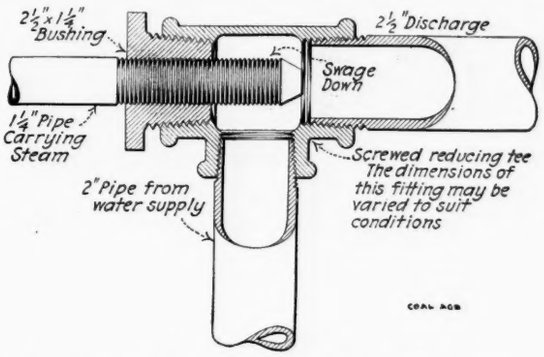
If none of the foregoing articles arouses your keenest interest, there are others that will surely appeal to you. One of these is entitled "Converting the Foreman to the Safety First Idea," and points out the tendency of the busy mine foreman to ignore the "safety-first" idea, until converted to it by the occurrence, under his charge, of some preventable accident. Still another article deals with "first aid to the injured," and gives practical suggestions regarding the best procedure in event of serious mine accidents.

We will also publish another of Mr. Braley's poems, which have become famous in every coal district of America. The next few weeks will witness the publication in COAL AGE of the most valuable and diversified list of articles ever collected for the benefit of coal-mining men.

A Small Water Lift

Where small amounts of water either under or above ground are to be handled about a mine, a steam lift, similar to the one shown in the accompanying drawing, may be easily made from pipe fittings.

One point should be noted, however, namely, that the tip of the nozzle should extend beyond the side opening or outlet of the tee, in order to produce the best results. If a device of this kind is properly constructed and installed, it is no trouble to make it lift water 6 ft. or more, while it can be made to discharge against a much higher head.


2½"x1¼" Bushing
2½" Discharge
Swage Down
1¼" Pipe Carrying Steam
2" Pipe from water supply
Screwed reducing tee The dimensions of this fitting may be varied to suit conditions
COAL AGE

SIMPLE STEAM LIFT FOR HANDLING SMALL AMOUNTS OF WATER

As will be clearly seen, this home-made lift works upon the well known principle of the injector. It may be argued, and rightly so, that this device is extravagant in the use of steam. While this is admittedly true, yet it possesses advantages which, to a large measure, offset its steam-heating capacity.

Among these advantages should be mentioned that it is small, light, can be easily and cheaply made, is simple in construction, has no valves or moving parts to get out of order, and is not nearly as liable to freeze up in cold weather as is an ordinary steam pump.

BY THE WAY

Be sure to forget the benefits you confer.

It isn't easy to blow and swallow at the same moment.

Three persons can refrain from quarreling if two are away.

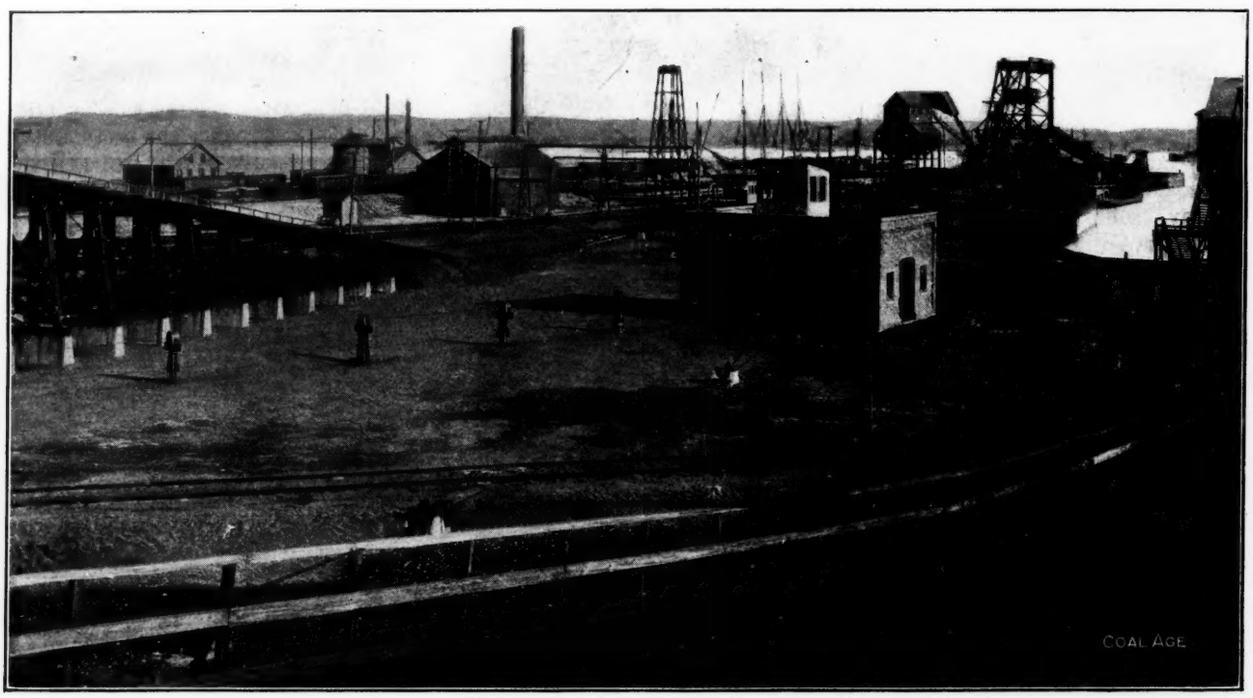
Weakness of mind is not the only great fault a man may nave.

Coal Handling at the Atlantic Coast Piers

By James Steelman

SYNOPSIS—A general description of the chief loading ports on the Atlantic Coast. The relative importance and growth of the various harbors are discussed. The development and comparative merits of different handling apparatus are also entered into.

It is probable that few, outside of the circles immediately concerned, realize the extent of the business of unloading coal along our Atlantic seaboard. Every year, more than 44,000,000 tons—1,000,000 carloads—are dumped into vessels for shipment coastwise and to foreign points. If the work were carried on steadily, instead of in a more or less irregular manner, each ten-hour working day in the year would see about 3300 carloads deposited in holds.



Lehigh Valley R.R. Co.'s Plant at Perth Amboy, in New York Harbor

This is quite a business and requires equipment and other facilities having a capacity far in excess of the average tonnage handled, for the reason that the maximum and minimum requirements are widely separated. A coal pier will be operating at capacity one day and the next the plant will be idle. And yet, it must be ready for its maximum business or at least a considerable increase beyond its daily average. While the coal piers of the principal Atlantic harbors actually handle only 1,000,000 carloads per year they have a capacity of 3,000,000 loads. If operations could be continuously at capacity, an equipment of 65 per cent. less than the present one would suffice.

The Atlantic seaboard of the United States possesses four large deep-water harbors, New York, Philadelphia, Baltimore and Norfolk. These are the coal harbors and they have channels varying from 35 to 40 ft. in depth. The mean tidal fluctuations range from 1.2 ft. at Baltimore to 5.3 ft. at Philadelphia. The maximum variation in the tide, 6.3 ft., occurs at New York.

New York Harbor

New York harbor is the greatest. It alone possesses thirteen ports served by nine different railways. Its capacity is sufficient to take care of the total discharge of coal for the entire group of four harbors, if only operations could be made continuous and at capacity. Here we have what is by far the longest coal pier on the Atlantic coast. It measures 1800 ft. from bulkhead to end of slip; it is located at South Amboy, N. J. Two others, each nearly as long, are situated at Harsimus Cove and Port Liberty, N. J. In fact, there are in New York harbor nine coal piers whose combined length totals 13,490 ft., an average individual length of about 1500 feet.

There are others whose lengths are unknown but whose capacities are such as to lead one to suppose they also belong to the class of long piers. However, it is not always the long pier that really has the greatest unloading facilities. Thus, at Port Greenville, N. J., a part of New York harbor, there is a 400-ft. pier having as great a capacity as the one already mentioned having a length of 1800 feet.

At New York, the coal is delivered mostly to small vessels—lighters and barges ranging up to 3500 tons cargo

capacity—which distribute it locally. There are but few coal cargoes for ocean shipment taken on directly from the piers. So, while New York harbor delivers much more coal to vessels, its facilities for the direct loading of large ships are, it would seem, inferior to other coal harbors of the Atlantic group. However, New York operates its equipment much nearer to capacity than any of the others. According to J. E. Greiner's analysis, New York operates at about 51 per cent. of its capacity, while the others cling to the neighborhood of 30 per cent.

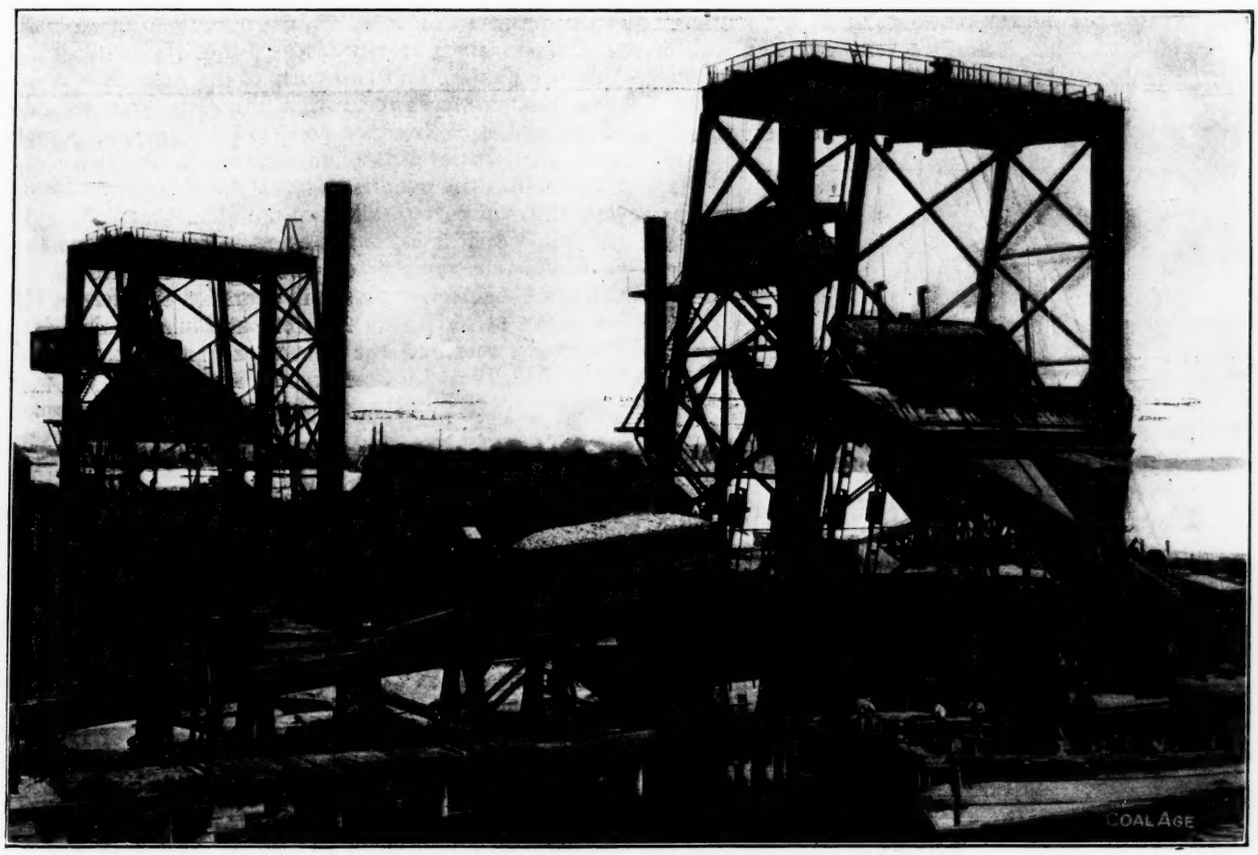
Varying Pier Heights

If we include plants now under construction, Norfolk harbor is entitled to rank next to New York in respect to coaling capacity. At New York, 4350 carloads may be discharged daily into vessels; at Norfolk, the new construction will bring the daily capacity up to 3180 carloads and cargoes up to 12,500 tons may be loaded directly from the piers.

This problem of loading directly from pier to vessel is made difficult by tidal fluctuations and more especially by the variations in the height of the hatches, occasioned by varying amounts of cargo on board. An empty ship on a flood tide presents its hatches at quite a different level than when loaded and floating on the ebb. The vessel moves up and down with the water and also with the variations in load. It is necessary that the dumping apparatus shall operate above the highest level attained by the hatch and shall also be able to deal satisfactorily with the lowest point. If the mode of dumping is a pure gravity arrangement, the pier should be from 33 to 43 ft. above the highest hatches to be loaded at mean tide.

In Norfolk harbor are located the highest piers of the group. The Norfolk & Western Ry. Co.'s Pier, No. 3, rises to a height of 70 ft. near the outer or sea end. The pier of the Virginian Railway Co. is only a foot lower, while two others now under construction will be about 91 ft. high. These four piers will put Norfolk far ahead of the other harbors in respect to its capacity for loading with the largest vessels. Philadelphia has a single pier of 66-ft. height already built and another of 62 ft. under construction, while Baltimore has two piers, 59 and 60 ft. high.

It might be thought, at first glance, that any arrangements that would take care of the highest condition of the vessel would, as a matter of course, also provide for the lowest condition. But the distance of fall must be kept within a minimum.



Carload of Coal Being Dumped at South Amboy Piers, New York Harbor

The number of piers at Norfolk will be 10 when the two now under construction are completed. Their average loading capacity is 318 carloads per day while at New York, the average is only 150 carloads. At Philadelphia, the capacity is 203 carloads and at Baltimore, 136 carloads. It will thus be seen that the piers at Norfolk, while not the most numerous, are yet much superior to those of the other harbors.

If we take note of the fact that New York has apparently no important piers under construction, we may say that Norfolk seems to be fast overhauling the northern harbor. It deals with the largest coal vessels and its daily loading capacity will soon be high. It is quite

possible that Norfolk will become a great coaling point, for the reason that its business is chiefly for outside delivery. At New York, the metropolis and its environs constitute probably nearly the whole of the ultimate market except the bunkering coal.

The Principal Harbors

The harbor of Philadelphia undoubtedly ranks, at the present moment, next to that at Norfolk, having a daily capacity—if we include two piers now under construction—of 2640 carloads, or more than half that of New York. It has 13 ports served by three great railways, the Pennsylvania, the Baltimore & Ohio and the Philadelphia & Reading. No doubt, a very considerable percentage of the coal unloaded at this port is consumed locally, just as is the case at New York. At Baltimore, the eight piers have a daily capacity of 1090 carloads. About twenty-five per cent. of this capacity is concerned with anthracite coal.

New York and Baltimore are apparently showing little interest over increasing their capacities. It is possible that the demand for additional facilities is slight. At Norfolk and Philadelphia, the new construction under way means a total increase in capacity amounting to 1860 carloads per day, or over 40 per cent. of the entire capacity of the thirteen ports and twenty-nine plants in New York harbor. The total pier length of the new construction amounts to 3965 running feet.

Car Dump at the L. V. R.R. Pier, at Perth Amboy

If we separate the bituminous and anthracite capacities, we find at once that New York is far and away the leading harbor. Her capacity for anthracite unloading totals 2700 carloads per day or 62 per cent. of her gross capacity. It is not very clear how Philadelphia harbor stands in respect to handling anthracite coal, but it must be that her position is far below that of New York. Baltimore has a capacity of 260 carloads per day, while Norfolk confines her activities to bituminous coal alone.

Thirteen railroads participate in bringing coal to the piers of these four harbors, the principal ones being the Pennsylvania, the Philadelphia & Reading, the Baltimore & Ohio, the Chesapeake & Ohio and the Central Railroad of New Jersey. These five lines carry 72 per cent. of the coal that is discharged at these four harbors. No one road carries to all. At New York and Philadelphia, the Pennsylvania is the leading carrier and at Baltimore, it stands second. The Baltimore & Ohio serves precisely the same three harbors; it leads at Baltimore, delivering to the unloading piers nearly half of all the coal handled. New York harbor is served by nine railroads and all the others by three each.

Methods of Handling at the Piers

There are three principal methods of discharging coal at the piers. When the coal is brought by gravity alone from the cars to the bins on the pier, or to the holds of the vessels, the pier is rated as a gravity plant. There are in use at the four coal ports of the Atlantic seaboard five different types of gravity unloading arrangements. The simplest of these is where the loaded cars are simply run out on a level pier and returned in the same way. Locomotives are required for handling both the loaded and the empty cars. The expense of this method, under favorable conditions, is not excessive for the reason that a considerable number of cars may be handled at one time. Altogether, there are in operation six piers of this type, two at New York and four at Philadelphia. It is uncertain when those at New York were built, but none at Philadelphia were constructed since 1865. We may, in view of this latter fact, regard the type as obsolete or obsolescent.

Another type of plant is that where locomotives run the loaded cars out on a level pier and the empties are returned by gravity. New York possesses the only two piers in this class. Although apparently economical, because of the possibility of handling strings of loaded cars by single locomotives and because of the simple method of return, they do not appear to be at all popular. One reason for this is that it is quite often impossible to construct a grade track out to the end of the pier at a sufficiently high level.

This idea is confirmed by a consideration of the pier where the loaded cars are pushed up an incline to the deck and the empties returned either by locomotives or by gravity. This is a popular type, 21 piers being constructed on this principle, 11 are at New York and the remainder at Philadelphia and Baltimore. While New York has no high piers, none exceeding 40 ft., all those over 30 ft. are constructed as just described. There are seven with heights from 32 to 40 feet.

The next most popular type is where the locomotives push the loaded cars up to a crest from which they drift by a slight downgrade to their unloading positions, the empty cars being returned by gravity; 14 piers of this class are now in operation, all four harbors having two or more.

A modification of the last type of pier is one where the loaded cars come down grade toward the sea to the foot of a steep incline up which they are pushed or pulled, by a cable arrangement, to a point higher than the final height desired. From this position they are allowed to drift down a slight grade to their unloading positions. They are then returned by gravity. All the harbors have one or more plants of this character, all the highest piers at Philadelphia, Baltimore and Norfolk belonging to this type.

Increased Use of the Mechanical Plant

Of the 56 coaling plants already constructed at the four harbors, 49 are to be classed as of gravity type, and one more is now under construction at Philadelphia. In New York harbor, however, there are six mechanical plants which have all been constructed since 1900 and another is under construction at Philadelphia. At Norfolk, one plant already constructed (in 1909) and two others under construction, all include mechanical handling in some way.

If we weigh these facts against the single gravity plant under construction at Philadelphia, we see that the influence of mechanical methods has already begun to extend itself to the discharge of coal from pier to vessel. When the new construction now under way is completed, mechanical operation will be the chief or an important factor in ten plants whose total capacity will be 2990 carloads per day.

In New York harbor, there are at South Amboy, N. J., two mechanical loading plants; at St. George, Staten Island, one, and at Hoboken, N. J., three, making six altogether. These have a combined daily capacity of 1190 carloads. The three at Hoboken handle anthracite coal; one at South Amboy both anthracite and bituminous; the remaining two, one at South Amboy and the other at St. George, bituminous. In Philadelphia harbor, at Greenwich, a mechanical plant is under construction which will have a daily capacity of 300 carloads. There are no mechanical or semi-mechanical plants in Baltimore harbor but in Norfolk harbor there is a plant which combines mechanical and gravity features having a daily capacity of 300 carloads. At Lamberts Point, Va., and Newport News, Va., two great combination plants are under construction. When finished, these piers having a daily capacity of 600 carloads each will rank as the leaders on the Atlantic coast. They will be 1200 ft. long and have a height of 91½ ft.; either will surpass in height by 21 ft. the present highest pier, which is also located in the same harbor.

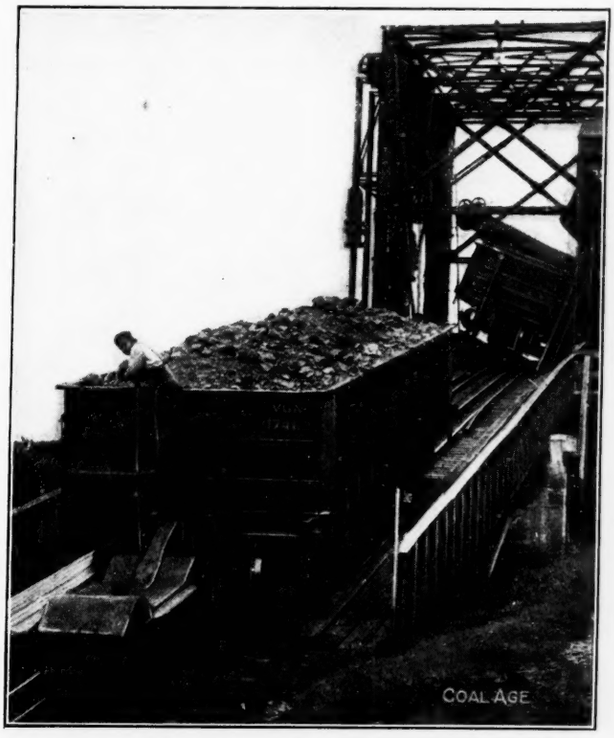
Method of Working the Car Dump

Five of the New York mechanical plants and the one under construction at Philadelphia operate on the same general principles. The car together with its load is made to ascend a steep incline, the power being applied by a locomotive or cable arrangement, to a device known as a "cradle." This is a piece of apparatus in which the loaded car is securely held and by means of which the whole may be elevated to the level from which the dumping is effected. This elevation is vertical; when the cradle and its car have reached the desired height, it is dumped over sideways. The coal runs onto an apron, and then into a chute which guides it into the open hatch of the waiting vessel. The cradle is then righted and lowered to its original position when it is ready to receive another loaded car. The empty car is returned by gravity.

In addition to the six plants at New York and Philadelphia, this method is employed in connection with a gravity pier and two others will be used in gravity piers now under construction, all three being in Norfolk harbor.

Another type of mechanical unloader is in operation at Hoboken, N. J., in the harbor of New York. This is a small plant, having a daily capacity of only 10 carloads. The coal upon being dumped is received by a hopper and then raised to the desired height by an endless chain conveyor which deposits it in bins from which it finds its way, by means of chutes, to the hatch openings.

The three combination plants differ, however, in the type of gravity pier employed in connection with the unloaders. Two great plants are under construction in Norfolk harbor on which the regulation railway cars are brought one by one into position on the cradle of a car dumping tower. When the car is overturned, the coal finds its way into a special form of car used on the dock. The empty railway car goes back by gravity to the yard and the loaded dock car passes by gravity or possibly by its own power, to the platform of an elevator which lifts it to the dock of the pier. It then drifts by gravity or



Virginian Railway Pier, at Sewall's Point, Va.

again under its own power to its position over the pockets. As already noted elsewhere, these plants will have a daily capacity of 600 carloads and will discharge on both sides which have 62 and 66 chutes respectively. They will probably be the two piers having the greatest capacity in the world.

The Practical Operation of a Coal Pier

The combination plant at Sewall's Point, Va., in Norfolk harbor is of recent construction, dating from 1909. The length of the pier is 1000 ft., both sides of which are used for coaling. There are 62 chutes, and the daily capacity is 300 carloads. The loads of the railway cars are overturned in a car dumping tower and find their way, load by load, into special dock cars. The former go to the yard under gravity and the latter are pushed or pulled up a steep incline by means of a cable to the shore end of the pier deck. This end is higher than the one next the sea, so that the cars pass along by gravity or "under their own control" to the pockets from which the coal is delivered to the vessels. The empty dock cars re-

turn by gravity, under brake control, to suitable positions near the car-dumping tower.

The practical operation of a large coal pier involves a multiplicity of activities. There is the office force, to begin with; on one pier the expense for this item amounted in 1911 to over $8000. Then there is the policing of the structure; for the same pier, the 1911 expense was $1416. These two items put a tax of a little less than one-half cent per ton on the coal discharged. Where the pier requires the loaded cars to be pushed or drawn up an incline, we have the items of locomotive service or of the other machinery operating on the incline.

Where no mechanical arrangements are provided for dumping the coal, there will be a considerable amount of labor required. Thus, for a good sized pier having a daily capacity of 300 carloads and actually averaging 200, there will be required, according to Mr. Greiner, about 64 men and one foreman. If conditions are favorable, a gang of eight men will unload a car in two minutes, but, when unfavorable, as where the coal has been frozen, three-quarters of an hour may be consumed by the same gang, with a single car. When the coal is delivered into the hatches, there is still the matter of trimming; that is, the upper surface must be shaped off. This is really a considerable item, costing in fact more than the unloading.

It appears that the expense of handling coal with the mechanical car-dumping equipment is distinctly less than where gravity and hand labor are depended upon for the service. Mr. Greiner estimates that gravity piers of the ordinary type are able to perform the duty of unloading into vessels at 6.32 to 6.41c. per ton; whereas the mechanical method permits a reduction of 1.76 to 1.85c. per ton upon these costs. However, there may be an expense for bringing the loaded railway cars to the cable, or to the car-dumping tower. Under such conditions, the gravity piers having a cable incline or the mechanical car-dumping plants would have to add something to their costs per ton. The mechanical plant will still show a distinct advantage amounting to 1.25 or 1.85c. per ton.

West Virginia's American Rivals in the Pacific Market

By W. A. MacCorkle*

SYNOPSIS—The author declares that the Pacific rivals of West Virginia have such serious disadvantages in the quality and disturbed character of their deposits that they cannot seriously compete. The Big Warrior canal, in Alabama, is not conceived on a large enough scale to promise brilliant success as a coal carrier. Pennsylvania is crippled by the diverse interests of her ports and of her railroads and is not encouraged to export coal by sea because there is already so generous a market at home. West Virginia will be easily chief of exporters when her canal system makes an all-water route available.

There are deposits of coal near the Pacific Ocean in our own country which demand consideration, and these, like some other coals of our Pacific rivals, merit consideration because they are located conveniently to the markets demanding them. Such are the coals of Alaska and Washington.

It is stated that there are enormous coal deposits in Alaska and that these coals are of prime quality. They may, in future years, become competitors with those of West Virginia, but I do not believe that they will ever compete with our coal until that far-off day when competition will not hurt us. With a distance of 6400 miles to the canal, with an inhospitable climate from 10 to 40 deg. below zero, with the necessity for every supply being brought long distances to the mines, and with labor to be imported and necessarily high, I believe that the cost of production will be so great that the product must reach shipboard at too great an expense for competition with our cheaply produced coal.

Competition with State of Washington

The State of Washington has six or seven coal areas which have been in operation to a limited extent since 1860, and are now producing about 3,500,00 tons per year, at an average price at the mines of $2.39 per ton of 2000 lb. As a rule, these coals are high in moisture and ash, and have a comparatively low heating value.

Forty-nine determinations which are representative of this state show an average of 10,923 B.t.u. Ninety-eight determinations of New River coal show an average heating value of 15,232 B.t.u., or almost 50 per cent. more than Washington coals. The average value of the smokeless coals at the mines, during the year 1912, including New River and Pocahontas, was a fraction under $1 per ton, so that the actual cost of our coals at Newport News or Norfolk is practically the same as the cost of the Washington coals at the mines. We do not believe that this coal will be a strong competitor of the West Virginia fuels.

The Alabama Fields Cannot Compete

In the popular mind the formidable competitor with the West Virginia coals for the Panama and American coast trade is the Alabama coal. An analysis of the situation shows that the popular belief is not founded upon fact. In the first place, a vast quantity of the best coals is reserved for several of the great steel-making corporations of that state.

The expectation of Alabama is to get its coals to Mobile by self-propelling barges. The coal will be transported along the Warrior River for 370 miles, passing through several locks. A channel depth of 6½ ft. with a width of 125 ft. is to be secured but the restricted dimensions

*Ex-governor of West Virginia.

Note—Abstract of last part of an address entitled "The Relation of West Virginia Coals to the Panama Canal," read before the West Virginia Coal Mining Institute, Charleston, W. Va., Dec. 8, 1913. The first part entitled "The Price War in the Markets of the Pacific" appeared Feb. 14 in Vol. 5, pp. 284-285. The second part entitled "West Virginia's Foreign Rivals in the Pacific Markets" appeared Feb. 21 in Vol. 5, pp. 360-361.

preclude the possibility of shipping large barges to their ultimate destination on the Panama Canal without reloading in transit. The river is tortuous and the water transportation today touches only the edge of the field. For many years much of the coal must be transported by rail to the river, loaded in barges and reloaded in seafaring vessels at Mobile.

The extent to which Alabama may become a competitor with West Virginia in foreign trade is practically answered by a study of the following figures, which show upon an analysis that Alabama can never become an enormous competitor with West Virginia in this field:

	Year	Alabama	West Virginia
Production	1912	16,100,600 tons	66,786,687 tons
Value at mines.....	1912	$1.29 per ton	$0.94 per ton

Alabama used 4,585,498 tons of coal in its coke ovens —equal to 28 per cent. of its entire production.

The United States Census returns, based on the business for the year 1909, show the following interesting comparisons:

Capital investment per one ton of annual production: Alabama, $3.17; West Virginia, $2.64.

Value of coal at mines: Alabama, $1.19 per ton; West Virginia, 86c.

Production costs, including wages, salaries, supplies, royalties and miscellaneous expenses in Alabama, $1.12 per ton, in West Virginia, 83½c.

Our New River and Pocahontas coals have far greater heating value than those of Alabama, and they can be delivered at Hampton Roads at a lower price than Alabama can quote either at Mobile or New Orleans.

The sailing distance from Hampton Roads to Colon is 1778 miles, and from Mobile to Colon, 1376 miles. This relatively small inequality in distance makes practically no difference in the rate to the Panama Canal, and shows almost conclusively that this field, which is largely engaged in consumption as well as production, will not be a formidable competitor.

For many years to come, the loading ability of Norfolk and Newport News will be superior to that of Mobile. The loading facilities at the West Virginia ports are as good as, if not better than, any in the world, and will only be surpassed by the wonderful loading machinery which is now being provided at both ends of the canal by the United States Government.

Alabama will certainly ship some coal in competition with Vest Virginia, but in the further harbors, and in the Panama market, she will not compete as vigorously as is popularly supposed.

New York City Too Valuable a Port for Coal Shipment

Let us consider briefly our competition with Pennsylvania for this export trade. The ocean port at which Pennsylvania coals are loaded, is New York Harbor. The great bulk of trade of Pennsylvania is not competitive with that of West Virginia. Her facilities for loading in the crowded harbor of New York will never be sufficiently great for the coals shipped from that port to dominate in the foreign markets. The harbor space is too valuable to be reconstructed for coal exporting and consequently its loading provision cannot compete with the great facilities at Norfolk and Newport News. In addition to this, her access to the shores is over a crowded and congested railroad. Our approach is over the railroads which have for their chief business the carrying of coal, and our loading points are those expressly provided for the freighting of a great ship at the rate of more than 1000 tons per hour.

Philadelphia, by reason of its natural situation, will not participate largely in export production. In fact, Pennsylvania as a whole, by reason of her enormous and increasing consuming ability, will be less and less a competitor in the more distant export field. She is devoting her energies largely to her great trade at the Lakes, in Canada and New England. While our coals are the equals of those of Pennsylvania, West Virginia does not compete in the Eastern part of the United States with that state, except on water-borne coals to Providence, Boston and Portland.

Pennsylvania to Decline in Exports

Pennsylvania will, year by year, relatively become less and less an exporter of coal. Her enormous consumption will mean the gradual relative reservation of her field for her own use and she will not seek new markets. This export market from its nature and the position of Pennsylvania will not be one sought by our great competitor in the coal trade.

This has been recognized by several of the great masters of the coal industry. E. J. Berwind, with the great foresight which has characterized his dealings in these matters, recognizing that these conditions will obtain, has invested millions in West Virginia coal, which he is using largely for the foreign markets, especially for the West Indies.

Even Maryland Is Not a Competitor

Maryland last year shipped less than five million tons of coal. While relatively not far from the market, the short haul does not give it the desired control. Our Fairmont region is further away, but is shipping West Virginia coal into Baltimore in competition with that of Maryland. The Maryland coals are unequaled for smithing purposes, and those who are familiar with the situation do not look upon her as a formidable competitor with West Virginia.

It will be noticed that I have included the Pocahontas field with West Virginia in this discussion, though part of that field is in Virginia. The Government of the United States, and largely the steaming trade also, have accepted the Pocahontas and the New River as the leading steaming coals of the world. One cannot consider them apart, even though an area of the Pocahontas deposit is in another state.

How Canals Will Help West Virginia

Another great factor which will aid in the cheap delivery of West Virginia coals is the river transportation of the state. West Virginia, with western Pennsylvania, is uniquely situated in this particular. She is on the line of the cheapest water transportation in the world. In this statement I include eastern Kentucky, which, in regard to river transportation, possesses practically the same advantages as are possessed by West Virginia, and a great part of this field is under the control of, and operated by, West Virginia capital.

The United States is making the most comprehensive water improvement along the Ohio and Mississippi Rivers which has ever been known to commerce. From Pittsburgh to Louisville, a distance of 608 miles, the Government is building 24 locks and dams. A great

and comprehensive scheme for the improvement of the Mississippi River is also under way.

Our present day demand for speedy delivery of freight and the unreliability of the water transportation heretofore provided have combined to make us indifferent to the great opportunity our rivers present for the carriage of merchandise.

This will be one of the great determining competitive factors in the near future. In twenty years the Government of the United States will have completed the slackwater navigation of the Ohio, and it will be the most perfect scheme ever conceived and executed. In all this vast distance there will be one placid stream of deep water, which will be, at most seasons, of unvarying depth. The Ohio River washes the whole western boundary of West Virginia, the Little Kanawha and Big Sandy are in process of improvement, and the Great Kanawha is already improved. All these streams reach into the heart of the state.

Coal at Colon for $3.50 per Ton

At Cabin Creek, practically the head of navigation of the Kanawha, the coal can be placed in barges at $1.15 per ton. From Cabin Creek to New Orleans is 1742 miles, from New Orleans to Colon is 1395 miles, making a total distance of 3137 miles. This distance must be contrasted with the 2159 miles from Thurmond to Colon by Newport News. It is estimated that coal will be transported from the West Virginia field to New Orleans at $1.25 to $1.50 per ton.

This West Virginia coal will be placed at New Orleans under its present conditions at a total price of $2.40 to $2.65. From New Orleans to Colon is 1395 miles and the freight is estimated at $1, thus placing West Virginia coal, at Colon, at $3.40 to $3.65 per ton.

Barges to Go Beyond Canal

The great objection to this method of transportation and this route arises from the fact that the coal under the present system of transportation must be removed from the barges and reloaded into sea-going vessels. This is no easy matter to accomplish.

The Government of the United States, investigating this question most carefully and looking to the future development of water transportation, proposes that steel river barges, with a draft of 6 to 10 ft. and a capacity of 500 to 1000 tons will, in a few years, be introduced, and these will have the added advantage that they can be towed on the Gulf and the Carribean Sea. The coal can be transported on these barges to all ports within the market zone of the canal. The Government Commission suggests that a barge drawing from 15 to 20 ft. of water can be loaded to a depth of 7 to 9 ft. at the mines, to a draft of 12 ft. at Louisville, Ky., and for six months of the year to 15 or 20 ft., at Vicksburg, Miss.

Summary

Under these conditions, according to the Government calculations, West Virginia coal costing $1 a ton and less at the mines could be shipped anywhere to the coasts of North or South America, and sold for $3 or less per ton. Our coal at this price would drive out all others, and would be less expensive by far than the coals at the Suez Canal. This ability to ship coal cheaply to the Gulf of Mexico would be shared by the Pittsburgh field, but with an added cost of transportation proportioned to the increased distance. It is idle to say that none of the coals of Pennsylvania, Maryland and Alabama will make their presence felt in the markets of the Pacific, but it is safe to assert that the coal of West Virginia will be the over-mastering influence.

I have based my argument on the New River and Pocahontas coals, for the reason that they have been adopted as a standard for steam purposes by the Government and by those in the market. This does not mean any disparagement to the great Fairmont or the Kanawha fields.

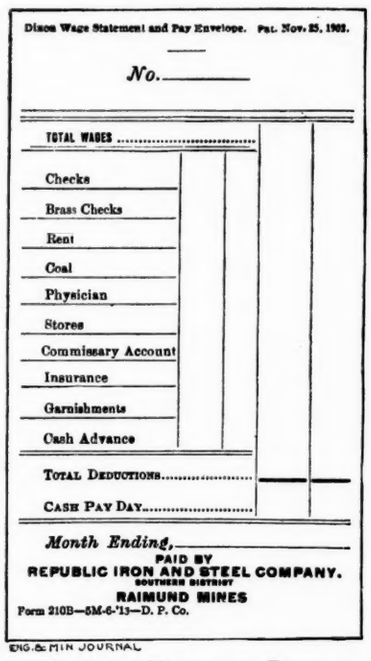
Generally speaking, I believe that the coals of the New River and the Pocahontas regions, which are what is known as the smokeless coals, and the No. 1 or Eagle seam and the No. 2 or Gas seam of Kanawha, which are semismokeless coals, will be the fuels which will be used at the canal. This will leave the other markets, which do not need such high-grade coals, open to the great Fairmont and Kanawha splint coals, which are well suited for steam raising and gas making.

Safeguarding the Pay Roll

By A. H. Sawyer*

It is stated that an employee sometimes fails to receive his wages because someone else has previously given his name and obtained the money without question.

To guard against such practice, the Republic Iron & Steel Co. uses the Dixon patent wage statement and pay envelope; the envelope is shown herewith, the statement is a duplicate of the form on thin paper. The statement and envelope are made out in one operation by means of a sheet of carbon paper, thus avoiding any discrepancies in number, name, items or balance due.


Dixon Wage Statement and Pay Envelope. Pat. Nov. 25, 1902.

No._____

TOTAL WAGES .....

Checks
Brass Checks
Rent
Coal
Physician
Stores
Commissary Account
Insurance
Garnishments
Cash Advance

TOTAL DEDUCTIONS.....

CASH PAY DAY.....

*Month Ending,*_____

PAID BY
REPUBLIC IRON AND STEEL COMPANY.
SOUTHERN DISTRICT
RAIMUND MINES

Form 210B—5M-6-'13—D. P. Co.

ENG. & MIN JOURNAL

Form of Envelope Duplicated on Paper Slip

The statement is handed to the employee previous to payday and is signed by him and presented to the paymaster on payday. The company is thus protected in that it retains the original statement duly receipted by the employee. The employee is also safeguarded in that he receives the envelope which is the exact duplicate of the statement which he presents to the paymaster. This seems to be as simple and efficient a system as can be devised.—*Engineering and Mining Journal.*

*Mining engineer, 412 American Trust Bldg., Birmingham, Ala.

"Safety First"

By W. E. Holland*

Is there a slogan for all mankind?
Yes, "Safety First."
One thing we should always keep in mind
Is Safety First.
When danger comes that's beyond our ken,
May we quit ourselves like noblemen,
And give our help to each other, then,
In Safety First.

You leave your home, to the mine you go,
Then, Safety First;
To barter with danger and death below;
Again, Safety First.
All through the day your vigil keep;
Your mind alert, you must not sleep;
Or you'll have cause to wail and weep
For Safety First.

In your neighbor's place the roof is loose,
Think, Safety First.
"I'm not his keeper" is no excuse;
But, Safety First;
He may be green, knows not the way
To protect himself, or again: he may
Be bold and ignorant enough to say;
"What's Safety First?"

When you prepare your daily shot
Mind, Safety First;
To the shot firer's dangerous gambling lot
Give Safety First.
"He's being well paid," you may reply;
On his safe return his babes rely;
And he, like you, needs a good supply
Of Safety First.

Then, be a Man and take a stand,
For Safety First;
Let it be said throughout the land
There's Safety First.
Let every man, in his own mind,
Feel for himself and all mankind;
And strive with a record hard to find,
For Safety First.

Coal Production, Pennsylvania

Reports received from the second and seventh bituminous districts of Pennsylvania show the coal production and other data of interest, as follows:

Second Bituminous District, C. B. Ross, mine inspector: Advance report shows a total number of 57 mines, of which 56 are in operation; seven of these being gaseous and 49 nongaseous mines. The report shows four new mines opened and three old mines abandoned. The coal production for this district is reported as 9,037,469 tons, of which practically 81 per cent. is the result of pick mining; 5.5 per cent. compressed-air machines; and 13.5 per cent. electrical coal-cutting machines.

The total number of persons employed in the mines is reported as 5809; the total number of accidents underground, 33 fatal and 40 nonfatal accidents. There were 273,863 tons of coal produced per fatal accident underground; and 176 persons employed underground per fatal accident in the mine.

Seventh Bituminous District, Charles P. McGregor, mine inspector: Advance report gives a total of 35 mines in the district, of which 33 are in operation, 20 being gaseous and 15 nongaseous mines. There were three new mines opened during the year and none abandoned. The report shows a total production of coal, for this district, for the year 1913, of 6,271,110 tons, of which practically 82 per cent. was mined by electrical coal-cutting machines and 18 per cent. by pick mining.

The number of persons employed underground is 7266. There were 15 fatal and 56 nonfatal accidents underground. This makes the fatality rate as follows: 418,074 tons of coal produced per fatal accident; and 485 persons employed underground per fatal accident in the mine.

*Mine inspector, District No. 1, Albia, Iowa.

Short Course in Coal Mining at Colorado School of Mines, Golden, Colo.

Opens Wednesday, Apr. 1, 1914. Ends Wednesday, May 27, 1914.

The following is a brief epitome of the subjects taught:

1. MINING. Opening new areas. Use of explosives. Haulage and loading. Drainage and pumping. Power. Surface equipment. Air requirements. Dust explosions. Ventilation. Mining methods. Elementary surveying. Mining machines.

2. CHEMISTRY. Elementary definitions. Composition of air, water, and mine gases. Combustion, and chemical principles involved in gas explosions. Theory of the safety lamp. Composition of coals. Practical laboratory work on coal and gas analysis.

3. MATHEMATICS. Weights and measures. Arithmetic, from ground rules and decimals to ratio and proportion. Simple physical problems, elementary algebra and use of logarithms. How to use the formula commonly required in coal mining.

4. MECHANICS AND DRAWING. A short course in mechanics, drawing, mapping, and the use of instruments.

5. GEOLOGY. Elements of geology, with special reference to coal deposits, with laboratory work on rocks, supplemented by short trips in the vicinity of Golden.

No fees for instruction. In the laboratory, material actually consumed will be charged for, also two or three textbooks, total expense not to exceed $5.

The course will materially aid candidates for positions in coal mines to pass the required state examinations under the laws regulating coal mining.

For further information address Wm. G. Haldane, acting president, Colorado School of Mines, Golden, Colo.

A New Byproduct Coke-Oven Installation

The H. Koppers Co., of Chicago, have recently closed a contract with the Lehigh Coke Co., a subsidiary of the Bethlehem Steel Co., for the construction of what is claimed to be the second largest byproduct coking installation in the world. The plant will consist of over 400 ovens, and will consume 6000 tons of coal per 24 hr. The construction will continue about two years, and will provide for the dismantling and rebuilding of a portion of the present installation which has not proved satisfactory. The approximate cost of the work is estimated at four million dollars.

Care must be exercised, in coal mining, to see that all stoppings are promptly and properly made and canvas curtains hung as soon as required, and that they are always kept in proper condition.

Important Details in Construction of Colliery Plants

By M. L. Hyde*

[This Article Is Unusually Long for Presentation in a Single Issue of Coal Age, However, the Subject Is One that Will Interest Most Coal Men, and Is of a Character that Will Appeal to Many for Filing Purposes. We Are, Therefore, Printing the Entire Article in One Installment, Believing that Such a Plan Will Best Suit the Convenience of Our Readers.—Editor.]

SYNOPSIS—Practical suggestions concerning the erection of an entire colliery plant. A plan for laying out the organization is given. Complete equipment of the various buildings is enumerated, and a method of handling the coal is described.

The rapid strides being made in our coal-mining industry place us all in a position where at any moment we may be called upon to undertake the construction of a new plant, and I have prepared this paper in the hope that it may be of some service to those who must meet the many complex problems such a task imposes.

After the property has been purchased and a plant site and tonnage capacity decided upon, the most important details in their order are:

1. The estimate of construction and operating capital required to put the plant on an operating basis. Few of us are familiar with estimating, and we either rely on consulting engineers who do not face the directors if the appropriation is inadequate, or we do the work ourselves; in either case we usually regret our choice, for detail after detail usually looms up that has been overlooked.

2. The plan of underground layout showing method of winning coal, ventilation, haulage systems, etc. Concerning these details, the practical operator is presumed to be well informed; further, the conditions are so varied as to be far beyond the scope of a paper as short as this must necessarily be.

3. The plan of surface layout showing relative location of mine openings, railroad yard, plant buildings and townsite. If construction and operating costs are to be kept a minimum; the modern colliery must have its plant concentrated and equipped with labor-saving machinery wherever practicable to do so. Particular attention will therefore be given the most important details coming under this division.

Estimating the Cost

In order to make an estimate cover fully the problems presented, we must arrange a basis on which to work. I would suggest that each unit be figured under three separate subdivisions, namely, improvement, equipment and operation.

An improvement account should represent the permanent, immovable unit; comprising, in the case of a building, the excavations, foundations for building, foundations for all machinery in said building, the building proper including all materials and labor going into its makeup, as concrete, brick, steel and woodwork, windows, doors, roofing, painting, light and phone wiring, heating and water piping, hardware, etc.

An improvement account in the case of a mine would represent the actual cost of bringing the mine to a given capacity in a given time; including the sinking of shafts or slopes, entry driving, sufficient room necks for the required capacity, all permanent timbering, ditching, sumps, overcasts, doors, regulators, stoppings, underground shops, office, underground storage for both empties and loads, all light and signal wiring and the labor in laying all permanent haulage tracks and power wires.

An equipment account should represent the more or less permanent yet removable units.

In the case of an office, we must figure on the lighting fixtures, furniture, typewriters, phones, safe, stoves, filing cabinets, etc.

In the case of a shop, there are the motors, transmission machinery, machine tools set on foundations, permanent small tools, such as dies, etc., that are stamped and must be accounted for in the inventory, tool-cabinets, lockers, etc.

In the case of a mine, we must consider the signal and phone apparatus, enameled signs, mine cars, locomotives, animals, mining machines, shot-firing magnetos, drills, pumps, motors, steel rails, ties, power and trolley wire, steam and water-pipe lines, car-hauls, etc.

The Operating Account

An operating account should represent the materials used in operation and of a less permanent nature than those in the equipment account.

In the case of an office, we have the heating coal, stationery, postage, lamps, printed forms, books, salaries of office force, porter, etc.

In the case of a shop, there are forge coal, bits, all small tools, oil, waste, lamps, wages, etc.

In the case of a mine, operation charges must cover the cost of timbering after the improvement period is closed, the cost of mine ties, spikes, brattice cloth, lamps, all wiring except permanent power and trolley, trolley hangers, etc., powder, tamping cartridges, tools, machinery upkeep and replacing of broken parts, all wages for entry driving, timbering, etc.

During the construction period covered by the estimate I should figure all of the accounts as operating, for example; the power house must manufacture power for running the shop, fan, hoist, etc., yet in the end it is doing so for the benefit of the mine improvement account, and the operating of all such units should be figured up for the time allotted for the construction of the mine, and then charged proportionately to the different improvement accounts enjoying them.

Laying Out the Organization

We should now lay out the organization required, and the wage cost of maintaining its officials or unproductive labor, as follows:

Mine Manager, to act as general supervisor, engineer

*General manager, Pembina Coal Co., Entwistle, Alta.
Note—A paper presented to the Canadian Mining Institute, February, 1914.

and surveyor, and to handle all mine construction. His employment should commence at an early date so that he may become familiar with every detail of the plant.

Master mechanic, and two or three erection assistants, all familiar with erection and pipe fitting. Under him will also come engineers, firemen, blacksmiths and pumpmen.

Chief electrician, and two or three erection assistants, all familiar with erection and wiring of electric machinery.

Surface foreman and gang of laborers familiar with grading, tracklaying, etc.

Tipple boss and gang of coal cleaners and yard men.

Boss carpenter and gang of erection, heavy- and light-framing carpenters.

Stable boss and drivers, to handle the stable and teams.

Accountant in charge of office, to handle books, cash, etc.

Payroll clerk to handle payroll, correspondence, filing, etc., and under him a time clerk to keep the distribution of wages.

Supply-house foreman, to check and store all incoming supplies, issue supplies, keep record of stock on hand, distribution of supplies issued, etc.

Store manager and clerk in charge of the store, its purchases, etc.

Arrangements should also be made to have a doctor give part of his time to the colliery during construction.

Next comes the cost of clearing and grading the property; this needs no comment.

Cost of Temporary Units

Then the cost of all temporary units to be used during construction with their equipment and operating cost, also the cost of tearing them down, less value of material salvaged. The temporary units usually required will include an office, store, cook house, bunkhouse, stable, closet, power house, supply room and shop, oil house, thaw house if dynamite or monobel is used, washroom, foreman's office, ventilating plant, narrow-gage tramroads for local transportation of supplies, and water and lighting systems.

Next, the cost of all permanent plant improvements with their equipment and operating costs during the construction period; including railroad yards, track scales, mine opening with shafts or slopes, boiler room with coal bins and conveyor, ash-handling cars, ash skip and bin, hoist-engine room, engine-room change house, supply room, machine shops, man-hoist engine room, tipple, mine office, pipe and bar-iron rack, oil house, man-hoist headframe, fan, water tank, mine closet, fire-hose reel shed, lamp room, powder magazine, thaw house, yard-track system, water, lighting and drainage systems, fencing, signs, engineering equipment, outside power and pipe lines, etc.

Then the cost of all townsite improvements with their

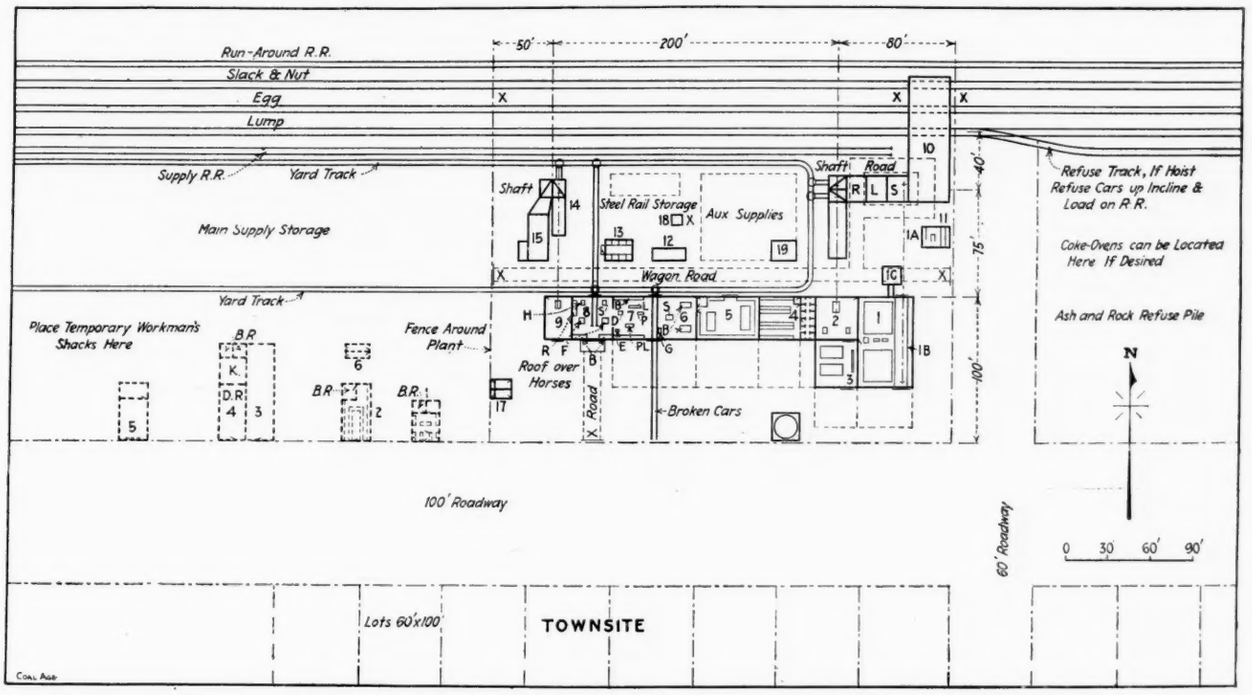


FIG. 1. A STANDARD DESIGN FOR MODERN COLLIERY PLANT

equipment and first year's operating, less receipt from rentals, including main office, store, hotel, club house, hospital, school, church, officials' homes, tenements, outhouses, lighting, water, drainage and sewer systems, fencing, sidewalks, streets, etc.

Then as a last consideration, there are miscellaneous requirements, such as the expense account covering fire and workmen's compensation insurance, hospital fees, traveling expenses, coal analysis, advertising, litigation, phone and telegraph service, entertainment, personal expenses, etc. The working capital account covering selling costs and freight charges on at least two months' shipments, during which time no returns can be anticipated, must also be allowed for.

Before going further, underground and surface layouts will be required, and in their completeness lies our protection in the accuracy of the estimates.

The underground plan should show the proposed development of the entire plant in rough and the work to be done during construction in detail.

The surface plan should show the relative position of the mine openings, all temporary and permanent plant improvements connected with the operation of the mine, and the townsite layout.

I believe that most mines having a daily capacity of 500 tons or over can be brought, so far as the plant improvements are concerned, to a standard design more or less approaching that shown in Fig. 1. This covers a shaft mine of one to two thousand tons capacity; but, with small alterations, such as the location of the fan, the layout is applicable to either drift or slope mines, and with increased or decreased size of building to any capacity mine.

The drawing is self-explanatory, showing the townsite located either to the north or south of the plant to avoid our prevailing west winds carrying boiler-room smoke over the houses; also located close enough to the plant

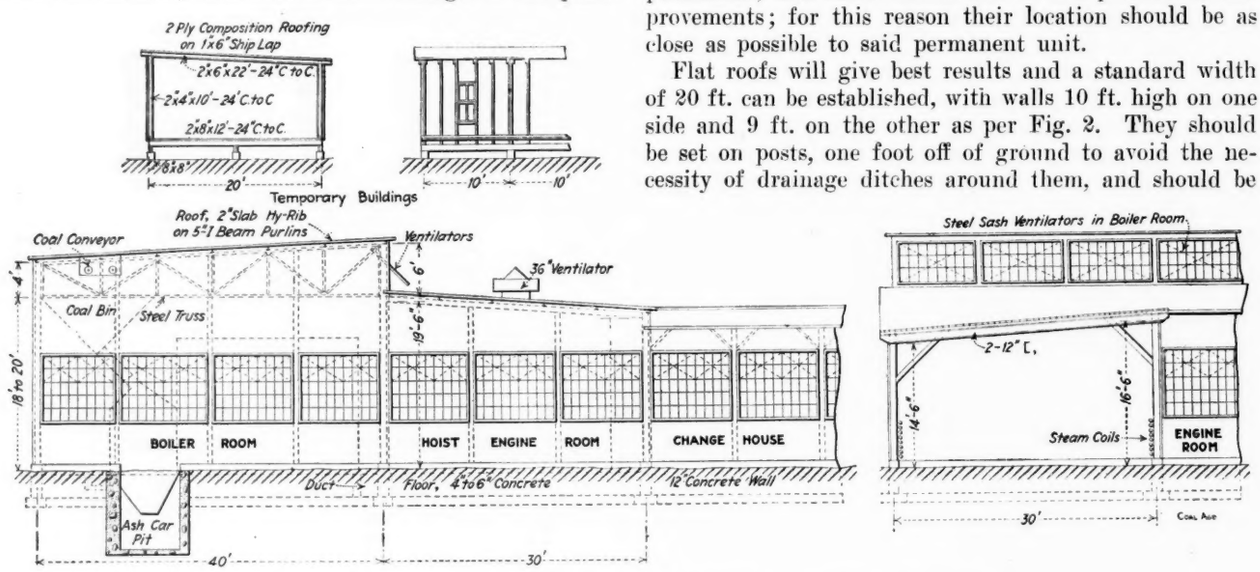


FIG. 2. CONSTRUCTION DETAILS OF TEMPORARY SURFACE BUILDINGS

that long walks to and from work are eliminated and so that no employees or children need cross the railroad yards.

The temporary units are set near the plant but so as not to interfere with the construction of any of the permanent improvements and yet allow of a minimum amount of land being cleared.

The permanent units are set along the line of yard tracks; this allows the railroad-grading contractor to grade the site at the same time as the yard. The location also allows of all supplies and heavy machinery being unloaded to the best advantage. Machinery for the mine can be sent down with the one handling and power-plant and machine-shop units unloaded direct to yard-trucks and skidded from them to their foundations.

A railroad yard approximately 330 ft. long by 235 ft. wide will be all that is required by the average mine. This can be fenced with a high galvanized wire fence on three sides, and none but employees on duty allowed through the gates. A fire-hose shed placed central with reels carrying 300-ft. lengths of hose will protect every unit. A night watchman can visit every unit and the storage yards at short intervals. Every person entering or leaving the gate is under observation from the mine office. The problem of lighting, drainage and sewage is a very simple one. All refuse from tipple and boiler room can be stocked along railroad tracks or loaded to cars at a minimum expense, and in case the piles should catch on fire, the flames and fumes would be carried away from the plant and town. I would mention that to make this layout entirely satisfactory, either fireproof or slow-burning construction must be used.

THE VARIOUS SURFACE IMPROVEMENTS

Passing to the details of the various surface improvements and their equipment, we have first, the temporary structures. These are required to get the working organization in shape as quickly as possible and must last at least one or two years. The buildings should be cheap and built of standard dimensioned lumber that can be easily salvaged. The equipment can, in most cases, be permanent, and later transferred to the permanent improvements; for this reason their location should be as close as possible to said permanent unit.

Flat roofs will give best results and a standard width of 20 ft. can be established, with walls 10 ft. high on one side and 9 ft. on the other as per Fig. 2. They should be set on posts, one foot off of ground to avoid the necessity of drainage ditches around them, and should be constructed entirely of 10-, 12- and 14-ft. lengths of 2x4-in., 2x6-in., 2x8-in. and 1x6-in. shiplap sheathing, one-ply building paper and two-ply composition roofing. All studding, sheathing and siding should be driven light with short nails. Both bunk and cook houses should be lighted from the roof, by rubber glass skylights: the cost is less than windows and the lighting better.

A TEMPORARY OFFICE

A temporary office should be about 20x30 ft. For equipment, it should contain superintendent's desk, two high desks and two low desks, one each for accountant and payroll clerk, two stools, six chairs, safe, stationary cabinet, stove, filing-system cabinet, drawing table, typewriter, telephone, fire extinguisher, engineering equipment including transit, drawing instruments, etc., for which an allowance of $1000 should be made. First-aid equipment, including pulmotor, first-aid cabinet, stretchers, medicines, etc., for which at least $350 should be allowed.

As to operation, we must consider salary of force during construction, including superintendent, payroll clerk, time clerk, draftsman, watchman, porter, stationery, supplies, heating coal, and an allowance of at least $2000 for printed forms covering departmental reports. In the

back of the office should be two 10-ft. square bedrooms, furnished, one for superintendent and mine manager, and one for office force. This furniture can be transferred to the hotel later and should be permanent.

The Company Store

The company store should be 20x40 ft. The equipment should consist of manager's desk, chair, cash register, scales, stove, fire extinguisher and telephone, all permanent. As to operation, there are salary of manager and clerk for three months, and $5000 allowance for stock. After this period, the store receipts should cover its operation.

In the back of the store should be a 10-ft. square bedroom for the manager and clerk, fitted with permanent furniture.

Other Buildings

Cookhouse—Size, 20 ft. wide by 70 ft. long, 40-ft. dining room in front. Equipment: 2 stoves, 2 tables and 4 benches. Kitchen, 20 ft. square. Equipment: Range, sink, table, counter, chairs, fire extinguisher and $500 allowance for utensils, dishes, etc. The range and dishes being permanent. Two rear bedrooms 10 ft. square with double bunks, two chairs and table in each, should be furnished for the cooks. Operation: This building should at once be rented to a reliable man and his wife; under no conditions should the company attempt to run it during construction.

Bunkhouse—Size 20 ft. by 70 ft. Equipment: Twenty to 40 double-deck, 2-ft. 6-in. wide by 6-ft. 6-in. long steel-spring bunks with cotton pads, 2 stoves, 2 tables, 4 benches, 2 wash sinks, and fire extinguishers. Operation: This building should be under the same people controlling the cookhouse. Attention is here called to a double-deck bunk made by Haggard and Marcusson, of Chicago, consisting of 2 steel spring cots set one above the other on a frame work of steel angles, and costing approximately $7 delivered, plus $2 for the pad or $4.50 per man. This makes a strong sanitary bed, economical in space and one that can afterwards be used in the hotel or company boarding house. Wood bunks with straw are one of the most serious vermin and disease breeders in a construction camp and I strongly recommend the additional expense required for the steel ones. They can also be used in the office, store and cook-house bedrooms.

Stable—Size 20 ft. by 40 ft. This will house 4 to 6 horses and a carload of hay and grain. Equipment: Wagons, sleighs, horses, harness, blankets, fire extinguisher, etc. Operation: Wages of boss and drivers, repairs, shoeing, feed, etc.

A water closet with private compartment for officials should be placed near the bunkhouse and operated by people running same.

Laundry—A small shack should be built and equipped with stoves, copper boiler, etc., for this purpose. It should then be rented to a Chinaman and an understanding had of the prices to be charged; invariably much trouble is experienced during construction in this quarter.

Pig Pen—The disposal of garbage is a serious item and a dozen pigs will prove the most desirable outlet. These can be kept by the stable boss and sold through the store to the cook house.

Temporary Buildings at Mine

Foreman's Office—Size 12 ft. by 20 ft. Equipment: Desk, drawing board, high desk for time keeper, table, chairs, phone, stove and fire extinguisher.

Shop—Size 20 ft. by 20 ft. Equipment: Forge, hand blower, hand drill press, swage blocks, mandrels, stove, fire extinguisher, etc. Operation: Wages of blacksmiths and machinists, small tools, blacksmith coal, oil, etc.

Supply House—Size 20 ft. by 20 ft., and forming extension to shop. Equipment: High desk, stool, stove, phone and fire extinguishers, also stock of repair parts for machinery, packing, hardware, picks, shovels, rope, tackle, wire, etc., also yard stock including mine props, ties, rails, trolley wire, bar iron, square timber, building lumber, mine-car lumber, bricks, lime, cement, gravel, etc., also oil-house stock, including all oils, grease, etc., and lastly powder-magazine stock, including explosives, detonators, squibs, etc. From $10,000 up should be allowed in estimate to cover this stock. Operation: Wages of foreman, freight, express and handling of supplies.

Miner's Washroom—Size 15 ft. by 20 ft., and forming extension to supply house. Equipment: Stove, wash sink, benches and fire extinguisher. Operation: Wages of keeper, heating fuel, soap, etc.

Boiler Room—The size of this building will depend on whether or not shafts are being sunk requiring compressed air; if not, hoisting engines with boilers attached, will be all that is required for erecting tipple and main building, in which case no boiler room will be needed. If shafts are to be sunk, a 60- or 70-hp. vertical boiler is easily salvaged and fills all requirements nicely. With this unit should be estimated such hoists, compressors, pumps, drills, and other miscellaneous machinery as will be required during construction. Operation: Wages of firemen and engineers, cost of fuel, water, oil, waste, removal of ashes, etc.

Estimate must also cover cost of sinking well for water-supply, also ditch and pipe line.

Each of the above mentioned units except boiler room can be built inside the lines of the permanent foundations of main building and when this is roofed they can be torn down and their equipment replaced in permanent structure at small expense. The boiler room should be located on a line, and central with the two shafts, and sinking engines placed on each side of boiler.

The temporary oil house and thaw house or powder magazine, will be merely shacks and require no special mention.

Outside Tramroads—It may be necessary to handle supplies a considerable distance from railroad station until yards are put in. In this case a tramroad of 16-lb. rails should be estimated on, also a given sum for its operation.

Tipple—This will vary according to location of mine opening and no details can well be given here. From shaft mines, all material, during sinking, will be handled over temporary headframes, and from drift mines a chute with bar screens will fill all requirements. This structure with equipment and operation including cleaning of coal, removal of waste and handling of railroad cars should be carefully estimated on.

Outside Lighting—Several large Milburn type carbide lamps will be required, also carbide for their operation.

The above units cover all temporary work required and as soon as supplies are on hand, the construction of both

the temporary and permanent plant can commence. The clearing of the property should be done in April, the grading in May, and the permanent building from June to November.

Permanent Units

The tipple equipment should include cages, head sheaves, ropes or car hauls or conveyors, dump hopper, bar screens, weigh pan, scales, inspection table, shaker screens, picking tables, chutes, boxcar loaders, motors, transmission machinery, phone, tally boards, signs, fire extinguishers, etc.

In designing this unit we have one of four different mine-opening conditions to meet. First, where the opening is above tipple dump requiring either retarding conveyors, gravity planes, tramroads or carhauls. Second, where opening is on approximate level with tipple dump requiring either locomotives or rope haulage. Third, where opening is below, requiring either engine planes, incline-conveyors or car hauls. Fourth, where seam is directly below, requiring cages and a headframe.

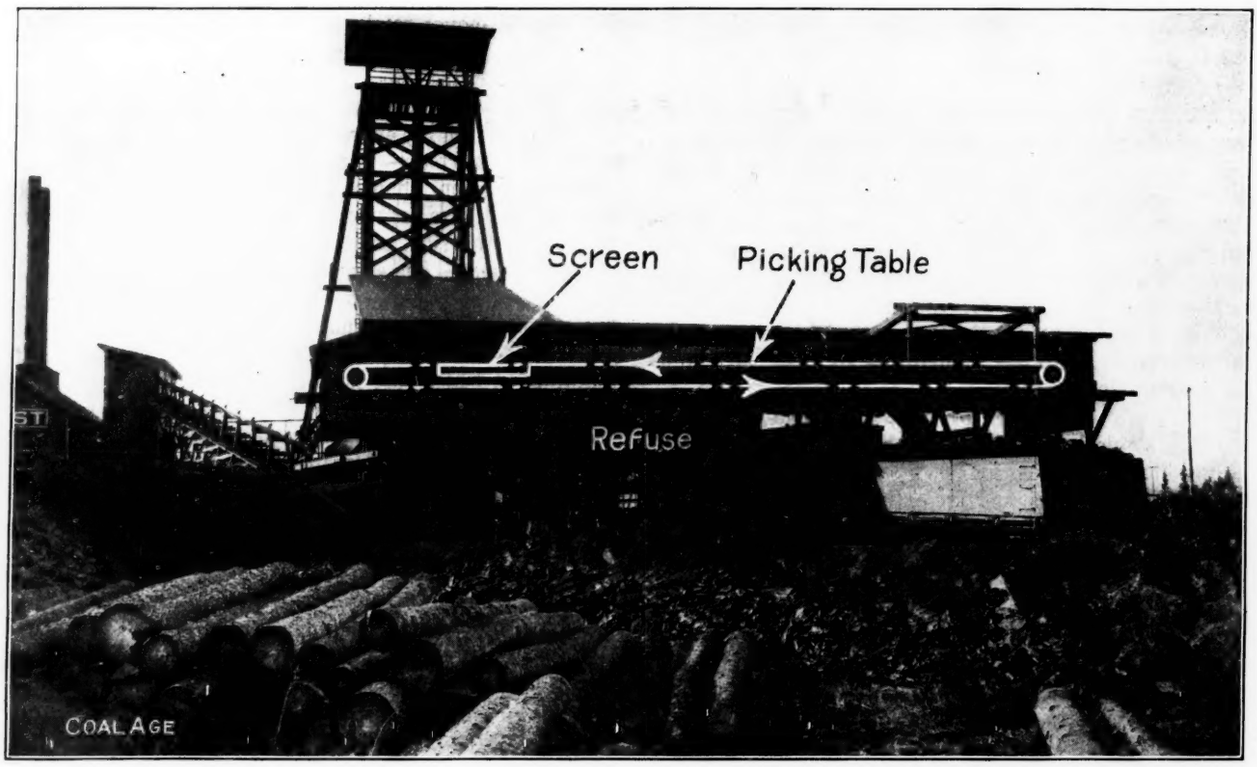


Fig. 3. General View of Tipple Building Showing Refuse Bin and Location of Picking Table

Conveyors Can Be Used Advantageously

Under conditions number one and three, conveyors can be used to best advantage where a capacity of 100 tons per hour or more is required, having the following advantages over lowering or raising mine cars on planes: They eliminate one man at the head of incline who handles the lowering machinery and at least one man at the foot; they have a capacity far greater than can be obtained from either cars or monitors on planes; and, running in a covered truss, are not subject to damage from storms as are open-track layouts and fewer mine cars are needed, as the length of time the car is kept out of the mine is much shorter.

Whether the conveyor drags, retards or carries the coal, there is absolutely no breakage during transit, and, where the scraper type, dragging coal on the bottom strand, is used, there is a perfect discharge to the tipple screen, so that in comparison with delivering the mine cars direct to the tipple and dumping the coal but once, the advantage is in favor of the conveyor.

The tipple should be a steel structure of minimum height, equipped with self-dumping cages, if a shaft mine, and should have the ability to load in either open or box-cars any sizes the market may demand or any combination of such sizes. It should have a bin in which rock can be dumped direct without having to pass over any of the coal-sizing machinery with the extra wear imposed due to its gritty nature. Next should come a bin for run-of-mine to be sold locally, this should also be arranged so that the coal does not have to pass over the sizing machinery as it must be sold at a close price to employees and homesteaders. Next to this should come a slack bin delivering either to wagons or to a conveyor which feeds boiler-room coal bins.

Method of Handling the Coal

Coal for market should be dumped direct to a hopper and from this should flow to an apron conveyor 5 to 6 ft. wide by 20 to 25 ft. long; this acts primarily as a feeder delivering the coal in a uniform stream to the screens; it acts also as an inspection table where the checkman can see from his office the entire carload spread out and traveling at a very slow speed. He can, furthermore, stop this feeder with a given load of coal on it and pick out and weigh the rock in case of a dispute between himself and the miners' representative. In screen-coal mines, the coal should flow from dump hopper over a bar screen to weigh pan and thence to above feeder.

From the feeder the coal passes over a short chute fitted with a butterfly valve to allow of its being dumped direct to local coal bin or with this valve closed to a shaker screen 5 to 8 ft. wide, by 25 to 35 ft. long, depending upon capacity desired.

In case of clean coal, this screen can lead direct over the different loading tracks, or a Marcus-type screen can be used to even better advantage if the coal is dry.

Where the coal is dirty and requires hand cleaning, I would in most cases recommend the following path from feeder, assuming four grades of coal are required: On entering the shaker screen, the coal should pass first over the nut perforations through which both nut and slack drop on to a slack screen, which should always be of the Cross Patent Lip type, consisting of 12-in. long slots set in rows with a 1-in. drop at the end of each; this tends to continually turn the coal over and bring the fines on the bottom. These slots are wider at the bottom than the top and are, therefore, self-cleaning. This screen is the best for slack, because in most seams carrying dirt bands, they usually break in thin lenses that will not go through round holes small enough to keep oversize coal out. The slack passing through cross screens goes to a slack bin and thence to boilers; or the screen should be so arranged that it can be blinded and the slack allowed to flow on to railroad cars.

The nut passing over the slack screen should go to a conveyor running at right angles to the shaker and there be picked and afterwards discharged to railroad cars on any track.

The lump and egg passing over the nut screen are separated on an egg screen and each is sent to a conveyor on which they are picked and then discharged to any of the railroad tracks. The different chutes should be so arranged as to gather from any of the three conveyors, and by this method any size or combination of sizes can be loaded on any track.

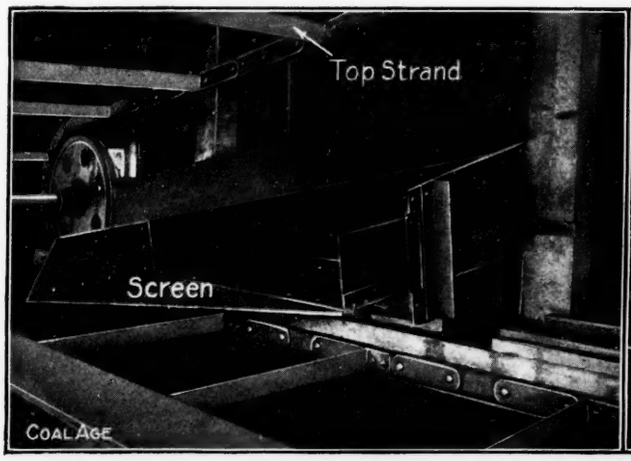


FIG. 4. INTERIOR TIPPLE VIEW SHOWING LIP OF SCREEN AND PICKING TABLE

FIG. 5. ANOTHER VIEW SHOWING WHERE LUMP, EGG AND NUT COAL ARE PICKED

DETAIL OF CAGES

I would recommend in most cases self-dumping cages with dumping rollers at top of dumping platform as greater leverage and consequent reduced strain on both cage and headframe is secured. The cages should be designed to allow the car to project beyond ends of cage, so that in a dumped position, the car would be lifted the minimum distance above apron, insuring a small drop to friable coal and no spilling down the shaft. The guide irons should be so curved that during the dumping period the car is rapidly dropped to the dumping position and while dumping is moved very slowly. Horns are preferable to drop rails for rapid work. Detaching hooks and double bridle chains should form part of the equipment of every cage. Wood floors are preferable to steel, being lighter and less slippery.

The prime reason advanced by the advocates of platform cages and the automatic pushing of the cars from same to cross-over or rotary dumps, is the question of saving in breakage. With the cross-over dump there is none, and with the rotary not enough to warrant the excessive extra cost of the tipple, extra cost of power to operate pushers and empty car hauls, and wages of at least two extra men in handling cars to dumps. In fact, with our modern self-dumping cages, I do not believe a rotary dump can do the work as quickly and with as little breakage.

DETAILS OF SHAKER SCREEN

The shaker screen should be of the single unbalanced type in preference to two screens working in so called balance. This statement will probably create much dissension, but a single screen driven by connecting-rods from oval-faced eccentrics keyed on an eccentric shaft, which in turn is carried on an independent framework from the tipple structure, will not put as much vibration in the tipple as a pair of screens. We have now in operation in a wooden structure an unbalanced screen 34 ft. long of the double-deck hanger type. This screen has a capacity of 150 tons per hour and makes four grades of coal. It has given us no trouble from vibration whatever, in fact, far less than I have experienced from carefully designed balanced screens carried on an independent steel framework figured with a fiber stress of but 4000 lb. The single screen costs but little more than half as much as a pair of screens and dischargs over much simpler chutes to the different conveyors.

In designing these screens, there should be a bearing on each side of each eccentric, the eccentric should be fitted with spring compression grease cups so that in case they tend to heat, more oil will be fed. The driven pulley on the eccentric shaft should in all cases be fitted with

a friction clutch for starting and stopping. No plates should be less than one-quarter inch thick and no reinforcing angles less than five-sixteenths of an inch.

Details of Picking Table

Figs. 3, 4 and 5 give an idea of the arrangement and operation of the picking table. Each table should lead from the screen over all tracks; each should have an independent motor drive and friction clutch for starting and stopping. They should be of the scraper type with a double strand of steel bar link chain carrying steel cross bars, of the same depth as the chain link, at 24-in. intervals. A strong and satisfactory picking table is made up of two strands of chain having 3-in. by ½-in. by 12-in. pitch links, 1-in. pins, 3-in. by ½-in. crossbars, 48-in. sprockets, and a speed of 40 ft. per minute. The coal is carried by the bottom strand on a ¼-in. steel trough, and discharged through openings to hinged chutes over the tracks. All picking is done on the 25 ft. or over length between the screen and the inside railroad track; the refuse bins being below the floor of this room and discharging to wagons, cars or conveyors, as shown in Fig. 3. The return strand travels back overhead on guide rollers.

This conveyor carries the coal as uniformly spread out as does the apron type; is fully as easy to pick from and can discharge all or part of its contents at any number of openings with a minimum breakage; the cost is much less, and but little more power is required to operate it; also, less headroom is required and a less expensive supporting structure is needed. With the apron conveyor, coal can be carried on the top strand only and discharged at one point only, over the head sprocket.

With this tipple construction, the bottom strand of conveyors need clear railroad tracks by but 18 ft. It is, therefore, an easy problem to design chutes for loading open or box-cars with but little breakage.

For loading box-cars with coal under 6 in. in size, the Ticknor Manierre loader made at Milwaukee is the cheapest in first cost, requires the least power and loads with the least breakage of any loader that I know of on the market. It has a further advantage in that one loader placed between two tracks, 19-ft. centers, can load cars on either track. For lump coal, I believe the Christy made at Des Moines, to be one of the most satisfactory.

Main Plant Building

The main plant building should be located as shown in Fig. 1. It should be so designed that extensions can be made in any department at a minimum cost and should preferably be fireproof and of a skeleton steel type with brick, or Hy-rib cement-plaster walls. A wooden frame with corrugated iron siding and partitions serves the purpose when first cost is a strong factor, being practically fireproof. The roof of this building should be nearly flat and made up of 2-in. Hy-rib on 5-in. I-beam purlins or 2-in. by 4-in. tongue-and-groove, kiln dried mill flooring with Barrett Specification Roofing, if the cheaper type is used. With this construction the building is easily heated, lighted, ventilated, cleaned, inspected and protected from fire.

At the tipple end comes the boiler room with hoist engine and engine room back to back against it, giving a most economical steam piping layout and allowing of extensions as desired. Next come the miners' change room, supply house, carpenter shop, machine shop, blacksmith shop and lastly the man and material hoist-engine room.

Boiler-Room Equipment

Boilers, stokers, draft equipment, stack, etc., must be included in the boiler-room equipment. For feeding boilers, slack coal will be brought direct from tipple by a wire-rope conveyor. Ashes will be handled in side-dump cars running in a tunnel underneath the boilers and discharging to a hopper leading to an ash skip, which in turn discharges to an ash bin from which the ashes are drawn to a wagon on the same street and at close proximity to the point where refuse from the tipple bin is taken.

Water-tube boilers should be installed in units of from 200 to 300 horsepower, and of not less than 150 to 175 lb. steam pressure. "Safety First," economy, and low first cost are conserved by their use. A rupture in any given tube is purely local and causes no serious damage, while with a return-tubular type an explosion would be the result. They are about 15 per cent. more economical in fuel and require approximately but two-thirds the cubical boiler-room space. The first cost of the plant installed will also be less.

No recommendations can be made relative to stokers as each coal requires special consideration. The fact that a good stoker will burn low-grade slack, eliminate smoke, and reduce the cost of fire-room labor usually warrants its installation.

With low-grade fuel many advantages are offered by an induced-draft system, since it is cheaper in first cost than a chimney and allows thick fires with strong drafts, thus promoting complete combustion.

Hoist Engine-Room Equipment

In the hoist-engine room, we must consider the main hoist, signals, phones and overwinding device. A Corliss hoist requires approximately 43 lb. of steam per horsepower and a slide valve 50 lb. or more, showing a saving of at least 15 per cent. in favor of the former. Exhaust steam may be used, but the greater first cost would keep this plan from being a profitable investment. Electric hoists are very expensive, and not warranted directly at the power plant, where low-cost fuel and mixed-pressure turbines can be used.

Engine-Room Equipment—If electricity is required, the mixed-pressure turbine-driven generator will prove most satisfactory and by storing exhaust from hoist in regenerators will allow of manufacturing power at no cost outside of upkeep. The turbine excels a reciprocating engine on account of the expansion which can be given to the steam at low pressure. At high pressures, the high-class reciprocating engine is more economical, but the advisability of installing both types of units in a new plant is a question.

If compressed air is required, the high-speed vertical compressors are very economical and generally satisfactory, and furthermore require but small floor area.

In addition, there will be required in the engine room, a switchboard, tool and clothes lockers, fire extinguishers, phone, desk, and boiler-feed equipment, including pumps and heaters. An open heater adds approximately 16 per cent. to boiler efficiency and therefore saves that much handling of coal and ashes. Closed heaters are not recommended for mine work. They are under pressure,

subject to temperature strains, hard to clean, do not save the exhaust condensed in doing the heating, and make no provision for the settlement of solids. Turbine-driven centrifugal feed pumps in duplicate complete the equipment with the most efficient and fool-proof machinery to be had.

Change-Room Equipment—Benches, clothes hangers, wash basins, shower baths, supply cabinet, fire extinguishers, etc. One shower bath should be allowed for every 25 employees.

Supply-Room Equipment—Shelves, bins, scale, phone, fire extinguishers, etc. This building should have a small office for a supply foreman.

Carpenter-Shop Equipment—Two benches, combination saw and grindstone.

Machine-Shop Equipment—Two benches, open-gap lathe, pipe machine, with set dies for making bolts, planer, large power-driven drill press and emery wheel.

Blacksmith-Shop Equipment—Two forges, 200-lb. power-driven hammer, combination hand punch and shear, two benches and pipe rack for local supply of bar iron and pipe. A 25-hp. motor with transmission machinery will be required for driving tools in all three shops. There should be a roof furnished over the back door of blacksmith shop, that horses waiting to be shod may be kept under cover.

Man and Material Hoist-Engine-Room Equipment—Steam or electric-driven geared hoist with phone and signal apparatus and overwinding device.

In the general arrangement of this building it will be noted that mine cars can be brought in for repairs over a minimum length of track from either shaft and that all supplies are carried near the shop where required.

The location of the other permanent units is clearly shown in Fig. 1. These can all be built at a moderate cost, using either skeleton steel or wood with cement plaster. The pipe and bar-iron rack can be built of 3-in. piping with standard fittings. No mention will be given the equipment of these various units except the oil house, which should have Bowser or equal self-measuring two-barrel tanks for every grade of oil used.

Steam heating will be required in the tipple, main plant building, mine office, oil house, lamp room and water tank; fire extinguishers should be placed in every room in every building, also buckets of sand wherever electrical machinery is in use.

The distribution of outside lights, layout of roads, yard tracks, etc., is clearly shown and their cost easily estimated. Care must be taken to cover the cost of outside power lines including poles, wiring, etc.; outside pipe lines, including supports, piping, covering, etc.; outside water lines, including ditching, piping, hydrants, etc.

Townsite Units—The design and estimating of the units will be taken up by themselves in a future paper, meriting as they do a special discussion.

Before closing, I want to give a few hints on purchasing the plant.

We have three choices before us. First, the manufacturer who maintains an engineering department, specializing on one or more of our wants, and who, free of cost, will make plans to cover all requirements. Such a manufacturer will also bid on the business against all competition, and, if successful, will be personally responsible, rectifying all errors without any additional charge. Second, the contracting engineers who either agree to build whole or part of the plant for a fixed sum, or cost plus either 10 or 15 per cent. These concerns usually have superb engineering organizations and good salesmen, but they must in turn buy everything from the manufacturer above mentioned, and in turn place the responsibility on him, nor can they buy cheaper in competition than ourselves. On a lump-sum basis, contracting engineers can, and often do, save their clients considerable money and a great deal of worry through his dealing with one responsible concern only, but so far as a "cost plus" basis is concerned, I can see nothing to recommend it in this class of work for we must stand the brunt of all mistakes and pay a commission on them besides. Third, we can build

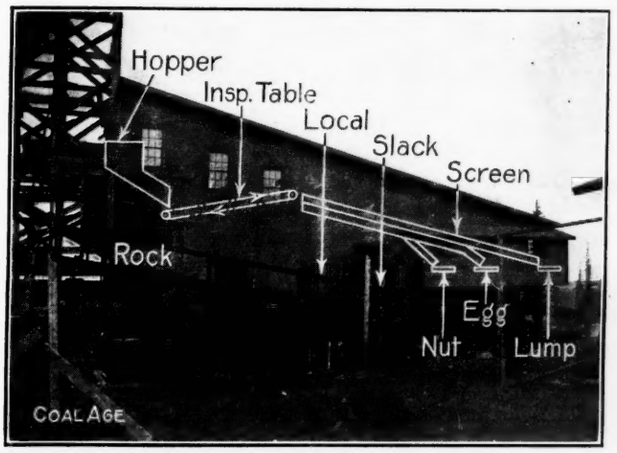


FIG. 6. SHOWING COURSE OF COAL THROUGH TIPPLE

our plant, or part of it ourselves. I would recommend doing the work part under condition one and part under condition three.

THE TIPPLE BUILDING

In the matter of building the tipple, I should ask the Link Belt Co., the Jeffrey Manufacturing Co., Head Wrightson, Ltd., and one or two others of that class to send their representatives, which they do without cost, and have them go over the ground. I would then carefully analyze all suggestions and give each company a general idea of the requirements, requesting plans and bids. Any of these concerns could also erect the main plant building, water tank, fan and track scales at the same time the tipple was being put up.

Machinery in Main Plant Building—I should ask the reputable boiler people, such as the Babcock and Wilcox Co., The Stirling Co., The Waterous Co., and one or two others to make plans and specifications covering the boilers, heaters, pumps and steam and water piping. I would also make arrangements for the use of their erector to place all heavy machinery such as engines and generators; the latter being purchased in competition from any of the reliable concerns.

The shop machinery with its transmission can be purchased complete from such firms as the Canadian Fairbanks Co., Ltd., Mussens, Ltd., etc. These people will gladly make, without charge, a layout for setting the different units; and their erection I should leave to my master mechanic, who can also erect all heating piping, etc. All wiring and erection of motors can be done by the chief electrician. All building of the temporary and

small permanent units by the boss carpenter, and all clearing, ditching, etc., by the surface foreman.

The grading of railroad yards should be let complete, including the placing of ties, laying of steel and switches, to a contractor specializing in this work and having the necessary teams, scrapers, camp equipment, etc., to do it; also one capable of putting up a bond.

For designing the small units and doing general drafting work, I should borrow a draftsman from the people furnishing the tipple, returning him at the end of the construction period.

Finally, after the estimate is made complete and covers every unit with its equipment and operation, at least 15 to 25 per cent. should be added for protection, in covering the many details that will still crop up.

Safety Requirements

By A. L. H. Street*

SYNOPSIS—An inquiry in reference to the legal performance of his daily duties by the mine examiner when he fails to report a miner's working place as dangerous and as a result the miner is badly injured by a fall of rock in his place. Another inquiry, asking if a mine is worked in compliance with the law when a night shift of miners is permitted to enter the mine and dig coal when no night boss is present and no one has charge of the mine.

An Illinois miner asks advice concerning the duties of Illinois mine managers and examiners, as follows:

1. There being a bad roof in a working place, the mine examiner took the miner's check, marked the miner out, marked the roof for loose rock and entered same on his report. The room was timbered that day and the miner worked the following morning, when the same conditions existed but were not reported by the examiner, and the presence of loose rock was not marked that day. Entrance checks were not held nor was the place marked off. The miner was injured before he could remove enough coal to place props to secure the roof. The place not being marked out and checks not being held, the miner, presumably, believed that no immediate danger existed. Did the mine examiner violate the law by not holding the miner's check and by not marking each day the place where dangerous conditions existed?

2. The mine is worked by both night and day shifts, but no one is in charge of the night shift. Is this mine being worked in compliance with the law?

1. That the Illinois coal-mine law was violated on the facts above stated appears from the following abstract of provisions of the law as found at pp. 430, 431 of the 1913 Session Laws. Section 21 requires a certified mine examiner at every coal mine, and makes it his duty to examine the underground workings of the mine within eight hours preceding every day upon which the mine is to be operated; to carry a rod or bar for sounding the roof; to inspect all places where men are required to pass or work, and to observe whether there are any recent falls or dangerous conditions in rooms or roadways; to inscribe in some suitable place on the walls of each room, not on the face of the coal, with chalk, the month and the day of the month of his visit, etc. When working places are discovered in which there are recent falls or dangerous conditions, he must place a conspicuous mark or sign there as notice to all men to keep out. On completing his examination, he is required to make a daily record of the same in a book kept for that purpose, for the information of the company, the inspector and all other persons interested; and this record must be made each morning before miners are permitted to enter the mine. The examiner is further required to take into his possession the entrance checks of all men whose working places have been shown by his examination and record to be dangerous, and to give such entrance checks to the mine manager (boss) before the men are permitted to enter the mine in the morning. Section 20 requires the mine manager to examine the examiner's report every morning and, if working places are reported to be dangerous, he must withhold the checks of men working in such places until he has advised them of the danger existing and instructed them not to work in such places until the reported danger has been removed, except for the purpose of removing the same. When a miner is permitted to enter a place of work, he is entitled to assume that the manager and the examiner have performed the above stated statutory duties.

2. Although the Illinois Mine Law seems to contain no express requirement that a boss be put in charge of night shifts, it contemplates that there shall be some one in charge, as is shown by the following summary of provisions contained in Section 20: Where there is a night shift mining coal, the mine manager is required to see that an examination of the working places is made by the "person in charge of such night shift, or some competent person authorized by him," before the men enter such places of work. The mine manager is, also, required to see that the top man and bottom man are on duty when miners are being hoisted or lowered. In mines in which the works are so extensive that all the duties devolving upon the mine manager cannot be discharged by one man, competent assistants must be appointed.

*Attorney-at-law, St. Paul, Minn.

Advantages of the Modern Steam Shovel in Mining Shallow Seams

Since the advent of the steam shovel into the coal-mining field, the old method of strip-pit mining has almost entirely disappeared, and where one is found it is usually on a small scale. As first manufactured, the steam shovel did not seem to adapt itself successfully to coal operations; however, a rotary-type shovel has since been designed, which does the work so well that new shovel installations are constantly being added to operations in the various fields.

Some idea of the amount of money invested in this type of steam shovel can be gained by reference to the Ellsworth-Klaner Construction Co., of Pittsburg, Kan. This company has in operation two of the model 270 Marion shovels, of revolving type. These shovels each weigh about 250 tons, and, ready for operation, cost approximately $50,000. They represent the largest type of revolving shovel built, equaling in size those used on the Panama Canal works. They are equipped with a 5-cu.yd. dipper, and a 90-ft. beam.

The two owned by the Ellsworth-Klaner Co. have twin boilers and operating together, have moved as

IN THIS OLD PIT, 14 FT. OF DIRT HAS TO BE REMOVED TO REACH 40 IN. OF COAL. NOTE LARGE NUMBER OF MEN AND HORSES NEEDED FOR THIS METHOD

much as 6700 cu.yd. in one working day, lifting and depositing the load on top of the dump. By comparing this record with that made on the Panama work, where one shovel moved 4823 cu.yd. in one day, dumping it onto flat cars instead of hoisting it onto a high dump, the wonderful labor- and time-saving facilities of this method of top-vein mining can be readily appreciated.

The accompanying illustrations, and those on the front cover, serve to emphasize the value of the steam shovel in coal-mine operations.

The photograph of the old method of strip-pit mining was taken near Columbus, Kan., and is admirably calculated to indicate to the observer the great waste of labor, effort and time formerly required in working the top beds, where the crust was too thin to permit of underground development. In this particular operation it was necessary to remove 14 ft. of dirt in order to reach and expose from 3 to 3½ ft. of coal.

The labor was also most arduous, requiring the maintenance of a large force of men and many teams. The great expense and small output resulting from this method have tended to discourage extensive operations, and the advent of the steam shovel has therefore found an immense field in readiness for it.

THIS LARGE TYPE REVOLVING SHOVEL COSTS ABOUT $50,000 AND HAS A 5-CU.YD. DIPPER

Editorials

Pumping in Coal Mining

The April 4 issue of COAL AGE will be devoted altogether to the subject of pumps and pumping in coal-mining work. We are anxious to make this particular number of our paper the most interesting and complete issue of the kind ever printed. With this idea in mind, we invite all our readers to send us notes and articles descriptive of ideas and installations relative to the subject of pumping. All matter should be in our hands not later than Mar. 27. Wherever possible, photographs and drawings should accompany the text.

Systematic Timbering to Prevent Accidents

Everyone familiar with coal mining knows that roof falls kill more men than any other cause. Here and there occasionally in the United States we witness a spasmodic effort to enforce some definite scheme for safeguarding the men from falls of rock. Practically nowhere has an entirely satisfactory method of handling the timbering problem been evolved. British Columbia, alarmed by its increase in coal-mine fatalities, now comes to the front with a set of rules which, if enforced, are likely to better conditions in that field.

Attention is called to these rules and regulations, which are published elsewhere in this issue. This is a move in the right direction and is worthy of the notice of American operators, mine inspectors and miners.

Standardization

The standardization of methods and details of equipment in coal mining, as in all other industries, is one of the first elements of success. That it is unnecessary to draw the attention of the management of large operations to this need is evident from the great advance that has been made in that direction, by the leading coal companies.

While the average mine operator readily recognizes the need of standardization in the details of his own equipment and the methods of operation; and the manufacturer, likewise, recognizes the same need in the shop and factory, there is a growing necessity for the more universal application of this principle in the coal industry. Standardization in the details of manufacture of American watches, automobiles, engines, power generators and all classes of machinery and equipment, is recognized as one of the chief factors in the success and growth of these industries. The application of the principle by each operator and manufacturer, however, has been, to a large extent self-centered.

There is, at the present time, a growing necessity for the standardization of mining methods and equipment that will be general. While it is commonly recognized by all familiar with coal-mining conditions that such a general standardization of much of the equipment must be made with due regard to the varying conditions in mines, it is clear to anyone giving the matter careful thought that a great advance can be made in this direction. We naturally look to the Federal Bureau of Mines as the recognized agency through which such general standardization can be best effected. The bureau has already done much to secure the enactment of more universal state mining laws and the establishment of a more universal signal system in mines. There is great need for a more universal system of examination and certification of mine officials.

Few operators recognize the advantage that would accrue and the reduction in first cost that would result from the adoption of a more universal standard mine-track gage. The manufacturers of mine equipment are, today, required to bid on the rolling stock, adapted to any and all gages, varying from 18 in. to the standard railroad gage, 4 ft. 8½ in. The question of a more standard or universal mine-track gage has recently been raised, in manufacturing circles, and attention has been drawn to the fact that, while the need of certain variations in track gage is an absolute necessity under the varying mining conditions, a considerable reduction in the cost of furnishing this equipment would be effected by the adoption of a classified list of standard mine gages, say 24, 36, 42 in. and the standard railroad gage, 4.7 ft. The question is asked: Why order a 34-in. gage when a 36-in. gage would answer every purpose; and, yet, such various orders are given and bids required.

COAL AGE earnestly invites a discussion in its columns by manufacturers of mining equipment and practical mining men, regarding the advantages and disadvantages of the general adoption of such a classified list of mine-track gages. There are arguments on both sides of the question.

Cost of Living and Miners' Wages

It is interesting to compare the cost of living with miners' wages. To this end we take the figures compiled by J. K. Johnston from 1897 to 1912 and the index figures of the Department of Labor for all commodities which is a percentage comparison with the average cost of those same articles from 1890 to 1899. It will be seen that the percentage of advance in the cost of living is 48.94 per cent. This compares very closely with the increase in the selling price of coal in Allegheny, Washington and Westmoreland Counties of Pennsylvania. That increase, as figured by Mr. Johnston, was 53.62 per cent.

But the increase in miners' wages is very much larger than the enhanced cost of living and, of course, that is as it should be, because production constantly involves less labor and consequently the workingman should year by year be enabled to buy more articles than ever before. We seriously doubt, however, if other workingmen have done

nearly as well. In fact, this truth is indicated by the smaller increases secured by the per-diem men. The market for their labor is probably influenced unconsciously more by outside conditions than is the demand for the labor of miners.

COMPARISON OF WAGES AND COST OF LIVING, PITTSBURGH DISTRICT

Year	Wages per Ton Lump Coal	Wages per Ton Run-of-Mine	Wages per Day Max.	Wages per Day Min.	Index of Living Cost
1897	$0.55	$0.3558	$1.78½	$1.52½	89.7
1898	0.66	0.4272	1.90	1.75	93.4
1899	0.66	0.4272	1.90	1.75	101.7
1900	0.80	0.5171	2.28	2.10	110.5
1901	0.80	0.5171	2.28	2.10	108.5
1902†	0.80	0.5171	2.28	2.10	112.9
1903	0.90	0.5817	2.56	2.36	113.6
1904	0.85	0.5494	2.42	2.23	113.0
1905	0.85	0.5491	2.42	2.23	115.9
1906	0.90	0.5817	2.56	2.36	122.5
1907	0.90	0.5817	2.56	2.36	129.5
1908	0.90	0.5817	2.56	2.36	122.8
1909	0.90	0.5817	2.56	2.36	126.5
1910	0.95	0.6140	2.80	2.49	131.6
1911	0.95	0.6140	2.80	2.49	12.92
1912	1.00	0.6464	2.95	2.62	133.6
Per cent. advance	81.89	81.69	65.25	71.80	48.94

† Year of anthracite strike.

Figuring on the rate for lump coal, we see that the miner now gets $1 where he formerly got 55c. With it he can buy only what he could have purchased for 67.14c. in 1897. So the increase in the purchasing power of his wages has been 22.07 per cent., or about 1.38 per cent. per annum.

So much for figures; but it must be remembered that the Department of Labor bases its estimates on wholesale prices and the miner buys from the retailer.

In 1897 the company stores of the State of Pennsylvania were largely relied on to make up all the losses in the producing end of the industry and to furnish the profits. As one operator stated: "In the nineties, storekeeping was highway robbery."

Today we are disposed to think that the charge against the company store is that it does business on so large a scale that its low prices injure the business of the village stores at which farmers trade. Prices are now in nearly all cases reasonable and coercion to trade at the company store is certainly extremely rare and always closely veiled. In fact the evil practices of past days are perhaps entirely eradicated.

One Advantage of the B. T. U. Method

Disregarding the various merits and demerits of the B.t.u. method in general, it is probable that all will agree as to the desirability of the system under certain conditions. One such instance has recently been called to our attention.

An official of a large manufacturing concern was induced by a fuel-testing company to have a report and analysis made on a certain large consignment of coal. It was understood that the fuel was a high-grade "Fairmont," W. Va., product. When the analyses were completed, it was found the ingredients were such as to preclude any possibility of the coal having originated in the Fairmont district. It was also proved that it was impossible to ship Fairmont coal to the point in question (because of excessive freight rates) at the price under consideration.

Further investigations on the part of the official disclosed the fact that the coal was not a Fairmont product, a low-grade Pennsylvania fuel having been substituted. In tracing the matter through, it was ultimately discovered that this was but one of several schemes by which an unscrupulous purchasing agent had been defrauding his company for a number of years.

The National Mine Accident

The statement made in our editorial, Mine Visitation, COAL AGE, Mar. 7, p. 415, in reference to the fatal accident that unfortunately occurred in the National mine of the Lackawanna Co., at Scranton, Penn., Monday night, Feb. 23, was based on the account given of this accident in the Scranton *Daily News*, Feb. 25.

We are advised by Supt. C. E. Tobey, of the Delaware, Lackawanna & Western R.R., Coal Mining Department, that the statement was incorrect in saying that the parties were lowered on the cage, and further, that they returned to the foot of an incline plane and watched the loaded cars going up and the empties coming down, there being no incline plane in that section of the mine. Mr. Tobey states that the parties walked quietly and secretly into the mine after dark, of their own accord, through one of the manway openings.

The editorial was written for the purpose of emphasizing the danger of strangers and persons unfamiliar with mining, visiting mines unaccompanied. All mine openings of any nature should be so protected and guarded that it would be practically impossible for any person to enter the mine surreptitiously. As stated in the editorial mentioned, it is common practice in the anthracite district to permit no unauthorized person to enter a mine without having a duly certified pass. The danger is not confined solely to the intruder, as an open light carried by such a one may ignite a body of gas with disastrous results; or, the ventilation may be deranged by the setting open of a door or the displacement of a brattice by a careless or ignorant person; or the signal system may be tampered with and put out of commission or made to give false signals, with fatal results. Every mine should be safeguarded at every point, in the surest manner possible.

The Panama Canal and Coal Mining

British mine owners for several years have had one eye on the Panama Canal, and the other on some special pieces of American coal acreage. Representatives of two important English syndicates have spent much time in this country recently looking the ground over. Because of its superior grade of coal and nearness to tidewater, the New River field in West Virginia has attracted their closest attention. Operators in this district have been quick to grasp the situation, and the price of New River coal land has been boosted materially.

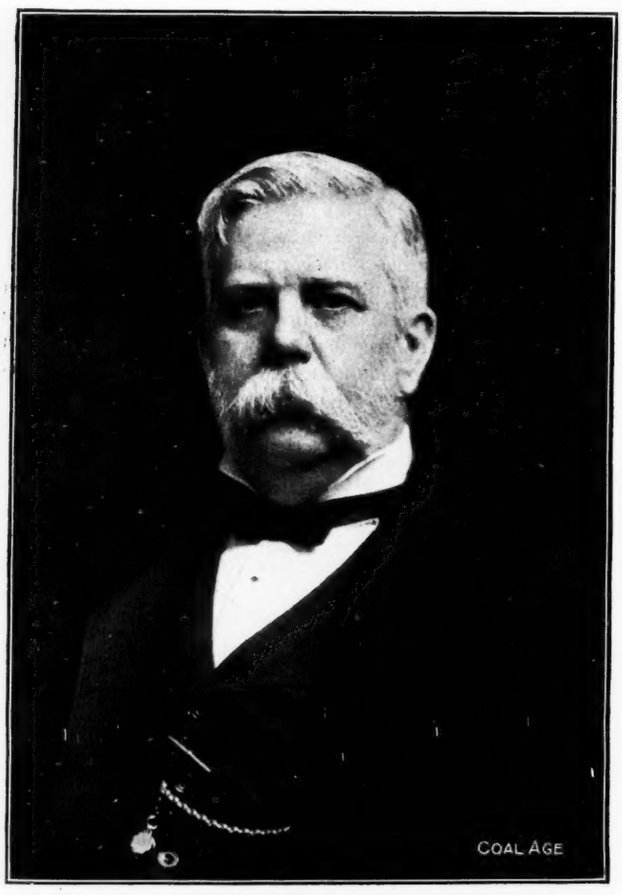
After reading President Wilson's recent message to Congress on "Canal Tolls," one group of English capitalists recalled their representative, the explanation being that American coal lands were not so attractive, if the British ships can use the canal on equal terms with American shippers. One of these English syndicates has something like $25,000,000 to spend. This shows only one effect on American industry that will result through approval by Congress of President Wilson's canal policy.

George Westinghouse

George Westinghouse, famous as an inventor, an engineer and head of the Westinghouse interests, is dead; the end having occurred at his New York residence on Mar. 12. In him the United States has lost one of its most conspicuous and deserving citizens—one whose name was known and honored throughout the world.

George Westinghouse was born in Schoharie County, N. Y., on Oct. 6, 1846, to George and Emeline Vedder Westinghouse. His father was an inventor, and the seed of genius which was his flowered to splendid proportions in the son.

Prior to his 15th year, Westinghouse perfected his first invention, a rotary engine; and less than two years later successfully passed examination qualifying him as an assistant engineer in the United States Navy. It was in this capacity that he served throughout the greater part of the Civil War, resigning at its close to continue his college studies. He entered Union College, where he completed his sophomore year, withdrawing at that time to enter a more active field of endeavor.



RECENT PHOTO OF MR. WESTINGHOUSE

Shortly thereafter, while en route for Troy, N. Y., a delay occurring through the collison of two freight trains, suggested to him the need of an automatic brake. He began work at once on this idea and developed an automatic brake attached to the couplers. This was tried but proved unsuccessful, as did also a similar invention operated by steam. His first thought of using compressed air as a medium was the result of reading an account of its use in digging the Mont Cenis tunnel, 3000 ft. under ground. He readjusted his plans at once, and soon perfected drawings of the air brake, brake cylinder and valves. Later, a practical trial was obtained, and the invention demonstrated a success.

The first patent was issued on Apr. 3, 1869, and the Westinghouse Air Brake Co. launched in the following July.

In 1870, the manufacturing works were completed, and Mr. Westinghouse went abroad to introduce the air brake into England.

Many changes and improvements were being made in the brake all the while, and business flourished. At an early date, the automatic feature of the brake was invented, thereby removing the danger of the parting of trains on steep grades; and, in 1886, the "quick-action" brake was perfected, the improvement consisting in what is known as the "triple valve," by which it is practicable to apply in two seconds all brakes on a 50-car freight train.

About 1880, Mr. Westinghouse became interested in the operation of railway signals and switches by compressed air, and soon thereafter developed and patented the "Pneumatic Interlocking Switch and Signal Apparatus," whereby all signals and switches are operated from a given point.

In 1886, the Westinghouse Electric Co. was formed for the manufacture of lamps and electric-lighting apparatus. The business rapidly developed, and in 1889 and 1890, this company absorbed the United States Electric Co. and the Consolidated Electric Light Co. In 1891 all of these properties were reorganized into the Westinghouse Electric & Manufacturing Co., which now owns extensive works in East Pittsburgh, employing over 22,000 people.

The question of the steam turbine and its application was investigated by Mr. Westinghouse; and in collaboration with the late Admiral George W. Melville, U. S. N., and John H. MacAlpine, he brought out one of the most ingenious devices of modern engineering—the mechanical reduction gear for reducing the inherently high speed of a turbine to the slow speed of a ship's propeller or direct-current dynamo.

Mr. Westinghouse rendered an invaluable service to the electrical development of the world when, in spite of opposition and ridicule, he remained steadfast in his efforts to perfect the alternating-current system and in his belief that this class of high-tension transmission would make distant electrical distribution possible. This system was perfected by his engineers, one of whom, Nikola Tesla, in 1887, invented the alternating-current induction motor. The world today, lighted by distant waterfalls and central stations, recognizes its debt to the foresight and perseverance of George Westinghouse.

Originating with one of the most important inventions connected with railways, the growth of the various Westinghouse industries has been largely identified with railway progress, and it is interesting to note that this progress has represented increased security of life, increased carrying capacity, and reduced cost of operation.

Mr. Westinghouse was connected with a large number of industries at home and abroad, many of which bore his name. He was president and director of Westinghouse Air Brake Co., Westinghouse Machine Co., Nernst Lamp Co., Union Switch & Signal Co., Société Anonyme Westinghouse, Paris, Cooper Hewitt Electric Co., Pittsburgh Meter Co., Société Italiane Westinghouse, Italy, East Pittsburgh Improvement Co., Westinghouse Brake Co., Ltd., London, Westinghouse Cooper Hewitt Co., London, Westinghouse Friction Draft Gear Co., Westinghouse Metal Filament Lamp Co., Ltd., London. He was also chairman of the board of directors of Westinghouse Electric Co., Ltd., London, and director of Westinghouse Electric & Manufacturing Co., Traction & Power Securities Co., Westinghouse Metallfaden Gluhlampenfabrik, Vienna.

The Westinghouse companies employ 50,000 men on whom 150,000 persons are dependent. The total capitalization of all the companies is $200,000,000.

Owing to his many achievements in mechanics, electricity, steam and gas he had many honorable distinctions conferred upon him. His alma mater, Union College, conferred upon him the degree of Ph.D. He was decorated with the order of the Legion of Honor; with the order of the Royal Crown of Italy, and with the order of Leopold of Belgium. He was the second recipient of the John Fritz medal. He received the degree of doctor of engineering from the Koenigliche Technische Hochschule, of Berlin. He was an honorary member of the American Society of Mechanical Engineers, of which body he was also president of 1910. He was one of the two honorary members of the American Society for the Advancement of Science. He was an honorary member of the National Electric Light Association of America. He was awarded the Scott premium and medal by the Franklin Institute of the state of Pennsylvania. He received the Edison gold medal for meritorious achievements in the alternating-current system of electrical distribution. He received the Grashof gold medal from the Society of German Engineers in Germany, which acknowledged him the greatest American engineer.

Mr. Westinghouse was married Aug. 8, 1867, at Brooklyn, N. Y., to Marguerite Franklin Walker. They had one son, George, who is a graduate of Yale, and who was recently married to the Hon. Evelyn Violet Brocklebank. His wife and son survive him.

Discussion By Readers

Mine Cars

Some time ago, attention was called, in a foreword, COAL AGE, Vol. 4, p. 639, to the size and kind of mine cars best adapted for use in coal mines. This has always been a matter of interest to me, and I beg to submit a few practical considerations that must be taken into account before deciding on the size and style of mine car that can be used to advantage in a given mine.

In coal mines, where it is necessary to take the cars to the working face to be loaded, the height of the seam practically limits the height of the car.

A bad roof or a heaving bottom will often require the driving of narrow entries, which, again, limits the width of the car that can be used under such conditions.

The length of mine car is generally limited by the width of the hoisting shaft. There should always be a safe allowance made for clearance in the shaft, varying from, say 6 to 12 in. at each end of the car. Unless otherwise specified, an actual clearance of 6 in. should be allowed and a further deduction of 6 in. should be made for the bumper and end board of the car, at each end; making the inside length of the car 2 ft. shorter than the clear width of the shaft.

The required capacity of mine cars is largely determined by the conditions in respect to the desired output of the mine, length of haul underground, grades of haulage roads and the kind of haulage employed; the last named item limiting the number of cars that can be hauled in a single trip. In deciding upon the capacity of cars, it is important to have due regard to the size and weight of car that can be handled under the conditions existing in the mine. This is determined practically by the condition and inclination of the tracks, the kind of tracking used, and the size of car wheels and condition of the rolling stock in general.

While men can push cars weighing 3000 lb. and carrying a load of 2½ tons, such cars are difficult to start and stop. In order to have the car always under control, it may be necessary to equip every car with a brake or to employ sprags, which are short, bobbin-shaped oak sticks that can be thrust into the wheels between the spokes, to prevent the wheel from turning. To insure safety and ease of handling, cars should not have a capacity exceeding, say 2 or 2½ tons, depending on the condition, inclination and kind of track.

Mine-car wheels are a most important factor in underground haulage. The size or diameter of the wheel and the manner of mounting, facility of lubricating and resistance to wear, both in the journal boxes and on the tread of the wheel, all exert an important influence on the ease with which the car is moved along the track and made to perform its office with the least interruption and delay. Mine cars having wheels 14 to 16 in. in diameter are much more easily moved than cars with wheels 8 or 10 in. in diameter.

The track gage is an important factor, which must be decided largely in accordance with the physical conditions in the mines. Narrow gages permit an easier movement of the cars than is the case on broad-gage roads, under similar conditions. Narrow gages also admit of the use of sharper curves than is possible with broader gages. In common mining practice, in this region, the mine-track gage varies from 28 to 42 in., depending for the most part on the size of the car employed.

The wheel base, by which is meant the distance between the axles or the wheel centers, is also an important consideration. This rarely exceeds 42 in., and is often only 30 in. Cars with a short wheel base can be used on sharper curves, and when derailed they are more readily replaced on the track. Improved wheels with roller bearings have been used for mine cars with great success.

Bituminous-mine cars are built in a great variety of shapes, styles and sizes. These seldom have a capacity of over 100 cu.ft., or, say 2½ tons, the average capacity being from 1.5 to 2 tons. The cars are usually built with outside wheels, the sides being flared above the wheels to provide an increased capacity. The cars are built for varying gages, and both loose and fixed wheels are used. Though wooden cars are generally employed, there are many steel cars in use. The latter have numerous advantages and some disadvantages. Though the first cost is higher than that of wooden cars, steel cars greatly outlast the latter.

GEORGE STOCKDALE.

Percy, Penn.

The Mine Worker

In his article, "One Reason Why Workmen Are Dissatisfied," COAL AGE, Jan. 3, p. 3, I doubt not that Ernest L. Bailey is honest in the opinions he there sets forth. My observations, however, have not led me to the conclusion that the laboring man "contemplates the division of the world's goods as a panacea for unhappiness and an end of toil"; or, that he regards his work "in the light of a makeshift against that time when the apportioning committee will hand him out his pro-rata share of the world's wealth."

I am not now speaking of labor leaders or agitators of a certain class, nor, yet, of the idler who does as little work as possible for as much pay as possible. I refer to the average, conscientious laborer or miner, who is anxious to give a day's work for a day's pay. I have faith enough in humanity to believe that the average laborer or miner is a conscientious worker.

In his social relations, the true mine worker is right in his belief that he has certain inalienable rights and can justly claim a few things above a place to sleep, food to eat and clothes to wear. His claim that he has a right to own his own home should be warmly supported by his employer. His ambition to furnish his home with comfort, not to say luxuries, should be encouraged. His tastes are simple, his needs few, and he has little desire or place for luxuries.

The mine worker has a right to a common-school education for himself and his family. The conditions of labor should be such that the conscientious worker will be able to keep his children in school during their younger years. Surrounding conditions should never be such as to permanently separate him from his family and forbid him the comfort and pleasure of home life.

Every worker has a right to certain diversions that serve to make life enjoyable as well as profitable. His work is made more efficient when he is able to devote a small portion of each day to social pleasure, exercise and study or reading. The hours so employed by the worker are as important and as remunerative to the employer as to the employed, because the worker is made stronger and more efficient and works with greater zest. It should be possible for the man who works by the day or week to be able to enjoy a brief respite or vacation that he can spend as he wishes on a hunting or fishing trip, or visiting old friends.

What it takes to secure these things for the worker constitutes, in my opinion, a "living wage," and is the honest worker's right. It is true, he may make his own choice of the manner in which he spends his time and money. He may choose between a bank account and a piano; or make a considerable sacrifice to secure an education for himself or some member of his family; but this sacrifice is at his own option and differs from that often forced upon him by untoward conditions under which he must work.

The average true worker does not want his employer's wealth. He knows he is a producer. The suggestion is unworthy of sober thought, that the true workman envies the possessions of another and desires that the owner of an industry should be dispossessed and his wealth distributed. The honest toiler is naturally independent and prides himself on his ability to do for himself and his own. He despises the dishonest workman who depends on the efficiency of another to cover his own lack. He has no use for the parasite in society or industry.

GEORGE N. LANTZ.

New Straitsville, Ohio.

Safety or Refuge Chambers in Mines

While there has been an occasional mention of the adoption of safety chambers in mines, as providing a means of escape from the effects of the afterdamp of mine explosions, one can but feel that insufficient attention is being given to this matter, in a practical way.

At the present time, we hear much of the "Safety First" idea. Would it not be well, now, to turn our attention, in some measure, to what might be called the "Safety After" idea? Much study has been given to the cause and prevention of mine explosions. The experiments, at Bruceton, have proven beyond a doubt that coal dust is explosive and that its presence in the mine workings is a menace to safety. There have been many suggestions to render the mine immune from explosions; but, after all has been done, explosions still continue.

It is true that much time and money are spent in the development of mine-rescue work, and the training of rescue corps, which we are forced to believe has been satisfactory only in a limited sense. In some cases, the heroic efforts of would-be rescuers, equipped with rescue apparatus, have resulted in sudden death to themselves. This is no reflection on those who have thus braved death to rescue others; but is, rather, a testimony of their courage and devotion to duty as they understand it. We must agree that, to attempt to save men suddenly enveloped in a death-dealing atmosphere, in darkness, among falling roof and timbers and surrounded by everything that conspires to kill, is a dangerous if not a well-nigh impossible task.

Is it not true that we have been studying this matter of rescue from its most dangerous side? The question may be asked: Do not these devoted rescuers brave a greater danger, in many cases, than that faced by those whom they would rescue? In every mine explosion, those who escape death are the ones who are fortunate enough not to have been caught in the path of the explosive blast, and who continue to breath mine air as yet not contaminated with the poisonous gases of the explosion. They have felt the concussion of the explosion that took place in another portion of the mine and they know too well its meaning. They realize the danger that confronts them, and their minds run riot, as to what to do or where to go. No time is to be lost; overtaken by the deadly afterdamp, their fate is sealed. Under these conditions, with no alternative, they rush toward daylight and safety, forgetful of or willing to hazard, as their only means of escape, the deadly atmosphere of the main roads leading out of the mine.

No argument is required to show what a boon to these men, would have been one or more properly equipped safety chambers, located at convenient points in the mine, to which they could have retired, instead of being forced to accept the only alternative of escape by passing through airways laden with deadly gases. Had such refuge places been provided, the survivors of the disaster in the mine, instead of being powerless and defenseless, would have been provided with all that was needed to insure safety.

The plan of such refuge chambers is simple and can but appeal to all practical mining men. A borehole or two would place the chamber in communication with the surface and permit of the ample ventilation of the place by the introduction of fresh outside air, and provide also a way of supplying food and other necessities. The chamber should be well secured against roof falls or the invasion of the deadly afterdamp of the mine. There should also be provided suitable first-aid equipment and restoratives. Would not the Federal Bureau of Mines do well to elaborate this scheme?

CHARLTON DIXON.

Pittsburgh, Penn.

The Hookworm Danger in Mining

The interesting and well illustrated article on "Concrete Vaults in Colliery Villages," COAL AGE, Feb. 7, p. 256, by Pennsylvania Mining Engineer, describes a great advance. All owners of coal-mining villages should read the article. It is from defective closets and, more often, from no closets at all that the hookworm spreads rapidly.

This subject has received little attention, while typhoid fever, and "swatting the fly" have received their full share. The hookworm revels in coal dust, particularly if it is damp. To lessen one danger, we increase

that from another source. We sprinkle the mine to prevent dust explosion, and thereby invite the development of the hookworm. The native hookworm has long existed in the Southern states, but after making careful investigation among the miners, in a section of West Virginia, I find many indications of its presence there, also. What is true of West Virginia, in this respect, is probably true of other coal fields in the states. Dr. Anders, a good authority and the author of a very popular textbook on the "Practice of Medicine," without special reference to the prevalence of the worm among miners, states: "The importation of infected Italian, Hungarian and Polish laborers into this country, may be accountable for the propagation of the parasite in the United States.'" At certain mines in West Virginia these classes of labor abound.

This parasite, the hookworm, became such a menace to health and detriment to labor, that it has been fought abroad by governmental commission. It is said by an authority on the subject that its presence renders certain of the most fertile portions of the earth uninhabitable.

West Virginia is famous beyond all states for the number of fatalities in its coal mines; and, strange to say, many of these fatalities are indirectly due to this small worm. The female worm never exceeds 0.25 in. in length. I have practiced medicine in the coal fields of West Virginia for many years and can usually tell from the "facies" and general appearance of a miner when he is infected with hookworm. Often, as I look on the dead face of a miner who has been killed by a fall of slate, because he did not prop his roof in time, I can read there the ravages of the worm. It causes weakness and carelessness. Ths man is sick though he does not lose flesh. He harbors a creature that looks like a miniature canthook. It is located high up in the intestine, which on account of its conformity is too steep for any other creature to hold on. He retains his position there by holding on with two hooks; while he bites with four teeth. He cannot be dislodged by the usual old-fashioned methods as easily as with a new remedy. He probably does more harm by poisoning the blood than by extracting anything from it.

To better this condition among miners, it is more important to have sanitary closets *inside* than outside the mine, and to enforce the most rigid discipline that such closets be used. There would seem to be no danger from the urine. The positive diagnosis of the disease is made from a microscopic discovery of the eggs. The adult worm is seldom passed except as the result of medicinal measures.

THOMAS R. EVANS, M. D.

Thurmond, W. Va.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

3. (a) Calculate the value of the pressure potential for the entire mine mentioned in the preceding question, the airways being 6x10 ft. in section and about 16,000 ft. long, including the return, assuming as before two equal splits; and (b) calculate from this pressure potential the power that will produce the desired circulation of air; namely 75,000 cu.ft. per min. and the resulting water gage.

Solution—(a) The total rubbing surface is $s = 2\ (6 + 10)\ 16{,}000 = 512{,}000$ sq.ft. For two equal splits, the area of passage in this mine is $a = 2\ (6 \times 10) = 120$ sq.ft. The mine pressure potential is then

$$X_p = a\sqrt{\frac{a}{ks}} = 120\sqrt{\frac{120}{0.00000002 \times 512{,}000}} = say\ 13{,}000$$

(b) The power on the air, calculated from the pressure potential, is then,

$$u = \frac{q^3}{X^2_p} = \frac{75{,}000^3}{13{,}000^2} = say\ 2{,}500{,}000\ ft.\text{-}lb.\ per\ min.$$

The water gage, calculated in the same manner, is

$$w.g. = \frac{1}{5.2}\left(\frac{q}{X_p}\right)^2 = \frac{1}{5.2}\left(\frac{75{,}000}{13{,}000}\right)^2 = 6.41\ in.$$

4. What volume of air will 10 hp. circulate in an airway 6x8 ft., in section, and 2500 ft. long?

Solution—The sectional area of this airway is $a = 6 \times 8 = 48$ sq.ft.; the rubbing surface $2\ (6 + 8)\ 2500 = 70{,}000$ sq.ft. The power potential is therefore

$$X_u = \frac{a}{\sqrt[3]{ks}} = \frac{48}{\sqrt[3]{0.00000002 \times 70{,}000}} = 429.1,\ nearly$$

For 10 hp. on the air, the quantity of air in circulation in this airway is

$$q = X_u\sqrt[3]{u} = 429.1\sqrt[3]{10 \times 33{,}000} = say\ 30{,}000\ cu.ft.\ per\ min.$$

5. (a) What quantity of air will be circulated, in the airway, in the last example, under a 3-in. water gage; and what power on the air will be necessary to develop this quantity and gage? (b) What was the original water gage when 10 hp. circulated 30,000 cu.ft. of air, in this mine?

Solution—(a) Since the square of the pressure potential is equal to the cube of the power potential

$$X_p = \sqrt{X^3_u} = \sqrt{429.1^3} = 8890,\ nearly$$

Then, $q = X_p\sqrt{p} = 8890\sqrt{5.2 \times 3} = say\ 35{,}000\ cu.ft.\ per\ min.$

The power required to produce a 3-in. water gage is

$$H = \frac{35{,}000 \times 3 \times 5.2}{33{,}000} = say\ 17\ hp.$$

(b) The previous water gage due to the circulation of 30,000 cu.ft., in this mine, under 10 hp. can be calculated in several ways; but most simply, thus,

$$w.g. = \frac{10 \times 33{,}000}{5.2 \times 30{,}000} = 2.1\ in.$$

The Coal Age Pocket Book

The calculation may also be made from the potential; thus,

$$w.g. = \frac{q^2}{5.2X^3_u} = \frac{30{,}000^2}{5.2 \times 429.1^3} = 2.1\ in.$$

Area of Passage—It is important to notice that the potential value for any mine is determined by its area of passage with respect to the resisting power of its rubbing surface. For a single air current the area of passage is the sectional area (a) of the airway. For 2, 3, etc., equal splits the area of passage is 2a, 3a, etc.; for n equal splits the area of passage, for the mine, is na.

The unit of resistance being k, the resisting power of the entire airway or mine is indicated by ks; and the potential values of the mine with respect to power and pressure of circulation, respectively, are thus expressed

Mine power potential, $X_u = \sqrt[3]{\frac{(na)^3}{ks}} = \frac{na}{\sqrt[3]{ks}}$

Mine pressure potential, $X_p = \sqrt{\frac{(na)^3}{ks}} = na\sqrt{\frac{a}{ks}}$

It should be observed that the mine power potential varies as the number of equal splits or currents, which is not true of the pressure potential of a mine. This fact has an important application, since, for the same mine, the rubbing surface being constant, the number of splits (n) is equal to the power-potential ratio. An example will serve to make this clear.

Example—Suppose it is desired to ascertain quickly how many equal splits would pass the same quantity of air (75,000 cu.ft. per min.), in Example 3, on the preceding page, under a 2-in. water gage, where two splits of air gave a water gage of 6.41 in.

Solution—The area of passage for two splits in this mine is $na = 2 \times 60 = 120$; and the rubbing surface being $s = 512{,}000$ sq.ft., the mine power potential is

$$X_u = \frac{na}{\sqrt[3]{ks}} = \frac{120}{\sqrt[3]{0.00000002 \times 512{,}000}} = 552.6\quad (2\ splits)$$

The power potential for a circulation of 75,000 cu.ft. of air under a 2-in. water gage is

$$X_u = \sqrt[3]{\frac{q^2}{5.2\ w.g.}} = \sqrt[3]{\frac{75{,}000^2}{5.2 \times 2}} = 814.8\quad (n\ splits)$$

Since the number of equal splits varies as the power potential, the split ratio is equal to the power-potential ratio, which is n : 2. Hence,

$$\frac{n}{2} = \frac{814.8}{552.6} = 1.47$$

$$n = 2 \times 1.47 = say\ 3\ splits$$

The reference, thus far, has been to the equal division of the air current, and the rules and formulas given above apply strictly, only to mines in which the air current is divided at or near the main entrance and passes through the mine in two or more separate and equal splits.

Inquiries of General Interest

Mensuration--The Circle

Can you give a formula, without the use of trigonometry, for finding the sectional area of a circular segment or the area of that portion of cross-section lying beneath the flat arch of a tunnel and above the springing line? The clear span of the arch is 12 ft., and the rise at the center, 3 ft. The arch is an arc of a circle.

California, Penn. READER.

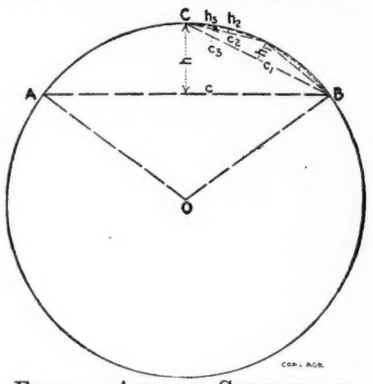
The simplest method of calculating the segment of a circle is to divide the half-chord of the arc by its radius, which gives the natural sine of the angle corresponding to half the arc. If the chord (c) of the arc and the rise (h) *only* are given, the radius (r) can be found by dividing the sum of the squares of the half-chord and the rise, by twice the rise of the arc or height of the segment, as expressed by the formula

$$r = \frac{(c/2)^2 + h^2}{2h}$$

Having found the radius of the circle, calculate the entire area (πr^2) of the circle, and multiply this total area by the ratio of the angle subtending the half-arc to 180 deg., which will give the area of the sector included between the arc and the two radii drawn to its extremities. To obtain the area of the segment subtending the arc, subtract from the area of the sector just found, the area of the triangle formed by the chord and the two radii mentioned. The area of this triangle is equal to the half-chord ($c/2$) multiplied by the radius of the circle less the rise of the arc ($r - h$). This is the usual and simplest method of calculating the area of a segment of a circle.

In order to avoid the use of trigonometry, in this calculation, it is necessary to adopt the same method of approximation that is used in finding the value of π for calculating the area of a circle. This method is as follows:

Referring to the accompanying figure, the first step is to calculate the area of the sector $OACB$; and from this subtract the area of the triangle OAB, as before. The area of the sector is equal to the length of the arc ACB multiplied by one-half of the radius OB. The length of the arc ACB not being given, may be calculated, approximately, as just stated, by finding the length of one of a number of small equal subchords, whose sum will approach very closely to the actual length of the arc.



FINDING AREA OF SEGMENT OF CIRCLE

Calling the original chord and rise of the arc c and h, respectively, and designating each subchord and corresponding rise, for each successive equal division of the arc, by c_1h_1; c_2h_2; c_3h_3, etc., it is evident that an expression of the total length of the arc ACB can be found by taking the sum of, say n equal subchords. Each successive subchord being calculated from the preceding one, the nth subchord will finally be given in terms of the original height or rise and the radius of the arc.

Without showing the development of this method, it will be sufficient to give the two basal formulas employed for finding the length of a subchord from the chord and rise of twice the arc subtended by that subchord. Since any chord of a circle is a mean proportional between the diameter and the rise of twice the arc subtended by that chord, the length of a subchord c_1 (see Fig.) is given by the formula

$$c_1 = \sqrt{2rh} \qquad (1)$$

This formula makes it possible to calculate the length of a chord of half an arc when the rise and the radius of the arc are known.

Again, since the half-chord ($c/2$) of an arc is a mean proportional between the rise (h) of the arc and the diameter of the circle less the rise of the arc ($2r - h$), the rise of any arc is equal to the radius minus the square root of the sum of the squares of the radius and half the chord subtending the arc, as expressed by the following formula (see Fig.):

$$h = r - \sqrt{r^2 - (c/2)^2} \qquad (2)$$

Now, applying formula (2) to find the rise (h_1) of the arc CB, corresponding to the first subchord (c_1), by substituting the value of this subchord, as given by the formula 1, in formula 2 and simplifying, the following simple formula is obtained, which gives the rise of the first half-arc, in terms of the rise and radius of the original arc; thus,

$$h_1 = r\,(1 - \sqrt{1 - h/2r}) \qquad (3)$$

This process can be extended and applied for finding the rise corresponding to an indefinite number of equal subdivisions of arc. If there are n subdivisions, the length of subchord (c_n), which is approximately the length of the corresponding arc, is found by substituting the calculated rise (h_n) in the formula

$$c_n = 2\sqrt{h_n\,(2r - h_n)} \qquad (4)$$

Finally, multiply the length of this subdivision of arc by the number of subdivisions (n) to obtain the length of the original arc ACB; and, again, multiply the calculated length of arc ACB by one-half the radius r, to obtain the area of the sector $OACB$; and from this area of the sector, subtract the area of the triangle OAB to obtain the area of the segment ACB. These areas are given by the following formulas:

$$\textit{area of sector} = nr\sqrt{h_n\,(2r - h_n)} \qquad (5)$$

$$\textit{area of segment} = r\,[n\sqrt{h_n\,(2r - h_n)} - c/2] \qquad (6)$$

Examination Questions

Miscellaneous Questions

(*Answered by Request*)

Ques.—If, on entering the mine as a fireboss, you found one of the splits completely shut off from the intake air, by a heavy fall of roof, what would be your duty in this case?

Ans.—The bituminous-mine law requires the fireboss to "place a danger signal across the entrance to every working place and every other place where explosive gas is discovered or where immediate danger is found to exist from any other cause." (Art. 5, Sec. 1.) He is also required (Sec. 2), immediately after completing his examination of the mine, to make and sign a pen-and-ink record of the same, in a book kept at the office for that purpose. The law states: "This record shall show the time taken in making the examination, and, also, clearly state the nature and location of any danger that may have been discovered in any room or entry, or other place in the mine." The fireboss must also "immediately report the location thereof to the mine foreman," whose duty it should be to see that the danger is removed as quickly as possible; and, till this is done, and the section examined and reported safe, no one must be permitted to enter that section of the mine.

Ques.—In making the examination of a mine for firedamp, could it happen that a fire would be found burning in one of the rooms turned off one of the headings; and what would be your duty in such a case?

Ans.—It frequently happens that the fireboss, in making his morning examination, finds that a fire has started at or near the working face. In most cases, this is due to the ignition of a gas feeder, by the flame of a shot; and, no one being present to extinguish the feeder, the coal became ignited and the fire gained considerable headway before it was discovered by the fireboss on his morning round.

The fireboss should at once give the alarm, so that steps can be taken to extinguish the fire, assuming that he is not able to do this himself. In some cases it may be possible to short-circuit the air so as to prevent the smoke and gases from the fire penetrating further into the mine workings. This should be done at once if it will not render other portions of the mine dangerous. It may, also, be practicable and necessary to reduce the circulation of air passing over the fire. In any case, no time must be lost in giving the alarm and securing efficient help.

Ques.—What should be the height of the motive column formed when the depths of the downcast and upcast shafts are each 300 ft., the temperature of the downcast shaft being 32 deg. F., and that of the upcast, 48 deg. F.?

Ans.—The height of the motive or air column, in terms of the *downcast* air, is calculated as follows:

$$hd = \frac{(48 - 32)\ 300}{460 + 48} = \frac{4800}{508} = 9.45\ ft.$$

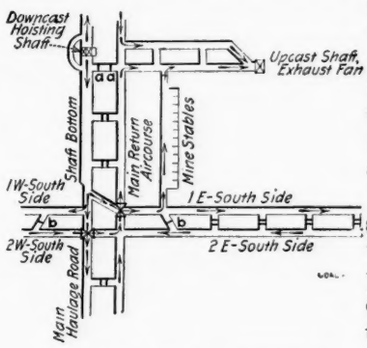
In like manner, the height of motive column may be calculated in terms of the *upcast* air, as follows:

$$hu = \frac{(48 - 32)\ 300}{460 + 32} = \frac{4800}{492} = 9.76\ ft.$$

Ques.—How should a stable in a mine be constructed and ventilated.

Ans.—A mine stable should be constructed in as nearly a fireproof manner as possible. It should be sufficiently high to permit of good ventilation, without producing a high velocity of the air current. The roof must be well secured against falls. It should have a good cement floor, be well drained, and ample provision should be made for the storage of the daily feed and refuse.

As shown in the accompanying figure, a mine stable should be located in close proximity to the bottom of the shaft, for the more economical handling of supplies and refuse, and the rescue of the mules, in case of emergency. The stable should be so arranged with respect to the intake and return airways, that it can be ventilated by a small scale of air taken from the intake current, which is returned at once to the main return airway and conducted out of the mine without passing through any other section of the mine. As shown in the figure the circulation of air through the stables should be controlled by double doors at the return end.



SHOWING ARRANGEMENT OF MINE STABLE

Ques.—How is air put in motion for the ventilation of a mine?

Ans.—Air, like other fluids, moves from a point of higher pressure to a point of lower pressure. There is always required, therefore, a certain excess of pressure in the intake airway over that in the return. This excess of pressure is created by means of a blowing fan at the intake opening, or an exhaust fan or furnace at the return opening or upcast shaft. The difference of pressure between the intake and return airways is called the unit of ventilating pressure.

Ques.—How many systems of ventilation are there in mining?

Ans.—There are two general systems of ventilation, known as the "blowing system," in which the air is forced or blown through the mine, under a pressure greater than that of the atmosphere; and the "exhaust system" in which the action of the mine ventilator causes a vacuous condition in the return airway, and the atmospheric pressure at the intake opening forces air into and through the mine. The mine is then said to be ventilated under a pressure less than that of the atmosphere.

Coal and Coke News

Washington, D. C.

President Wilson has signed the Alaska railroad bill, which is designed to give him the power to construct a railroad in Alaska, located at his own discretion, in such a way as to furnish means for opening up the coal fields and other natural resources of the territory. The bill as already well known provides an appropriation of $35,000,000 to be obtained as needed through the issue of bonds, but $1,000,000 of which is made available in advance by means of direct appropriation from the Treasury. The understanding is that there will be no delay in starting the work and Secretary Lane, of the Interior Department, has already had a long conference with the President about the selection of the men who are to participate in the locating and constructing of the new line.

An interesting phase of this matter, however, is found in the fact that it is one element in a large program of Alaskan exploitation, which is primarily intended for the opening up of the coal fields and has in view the substitution of government enterprise for private control and operation of the mining possibilities of the territory. It is now intended to push as a completion of the scheme, the bill providing for the so called "Alaska Development Board," which is to consist of three persons appointed by the President to "have jurisdiction and control over the care, use and disposition of all reserved and unreserved public lands, including forests and waters and resources—mines, minerals and mining." While it may not be that there will be any effort at direct government operation of the mines of Alaska, even if the whole program that the Administration has in mind goes through, several such schemes are already on foot and may have more or less importance.

Representative Bryan has introduced a bill intended to provide for the immediate and rapid development of Alaskan resources at a greater speed than seems likely to be possible under the very broad general policy of development that has been mapped out by the Administration in connection with its Alaskan railroad plan. His scheme is to organize a service to be known as the "Alaska Mining Service," for the purpose of getting out coal. The "Alaska Mining Service" would be "charged with the duty of operating coal mines on lands reserved to the Government and the distributing stations and of selling coal," in a manner to be prescribed. The bill then goes on to indicate methods of leasing at the discretion of the President and to prescribe the methods of employing men in the event that the President deems it preferable to do the mining himself. In the event of leases, the land thus leased is not to exceed 3,200 acres, and no person interested in common carriers is to be allowed to own or have any interest as a stockholder or otherwise in any lease. The charge for the lease is to be at the following rate: "25c. per acre of the leased premises for the first year; 50c. for the second year; $1 for the third year," and thereafter the same charge per annum throughout the continuance of the lease. A certain percentage of the proceeds of the enterprise are to be set aside and kept for the purpose of improving, extending and developing the transportation and other facilities for coal mining in the territory of Alaska.

HARRISBURG, PENN.

It is reported here that American coal is blamed for the total failure of the new coke-oven plant at South Bethlehem. Practically every one of the 300 ovens will soon be useless.

In Germany the ovens would have worked to a nicety, but the American coal generated so much greater heat that the insides of the coke ovens have been unable to withstand it. The entire battery of 300 ovens erected at a cost of between $6,000,000 and $8,000,000 are an almost total loss and will be torn down.

The Didler-March Co., a German concern, was the constructing company, and the financial banker was the Deutsches Bank, of Germany. On the latter, it is said, will fall the heaviest loss.

It is also said that the brick used in the construction of the ovens, especially the inside, was of an inferior kind. When the Germans received the contract to erect the first coke ovens of their kind in America, they started a brick-making plant at Valentine, N. J. Unfortunately, this burned down some time ago and the Germans had to look elsewhere for constructing material.

They were practically swindled, it is alleged, for the quality of brick was decidedly inferior and melted under the intense heat.

Money ran like water in the building of the plant. Wages were high, and policemen who were employed to guard approaches to the plant, were paid 50 per cent. more than the policemen of Bethlehem. The Germans are acknowledged to have the best patents on the methods of coking in the world, and their efforts to guard against the stealing of these patents were costly. A force of high-priced detectives was employed for a time.

When the furnaces were first started it was calculated that 150 carloads of coal a day would be required. This, provided the ovens worked all right. But they didn't. Nevertheless the 150 cars of coal continued to arrive each day, and soon the yards were overflowing, and heavy demurrage charges resulted.

But things have not changed with the formal transfer this week of the plant to the operating company, the Lehigh Coke Co. Another start is to be made. The worthless plant is to be dismantled and new batteries of between 400 and 500 ovens are to be built, and will use about 5000 tons of coal a day.

The original contract called for the erection and operation of the plant by the Germans, C. M. Schwab to furnish all the coal and get all the coke and gas, the Germans to receive the byproducts from which they hoped to make millions of dollars a year.

* * *

One of the most striking articles that has come from the Anthracite Operators' Press Bureau, is the one issued about Mar. 12. It cites the reason of one of the best known mining officials in the anthracite region for granting the check-off to the United Mine Workers.

The article is as follows:

If over a half century "on the job" carries any weight of conviction, a letter recently received by Samuel D. Warriner, president of the Lehigh Coal & Navigation Co., presenting a miner's view of the United Mine Workers' recent request for the check-off in the anthracite region of Pennsylvania should be of interest.

"Having been during a period of over fifty years a member of several miners' organizations, including the U. M. W. of A.," he wrote, "I have always believed in the protection of labor to obtain fair and living compensation in so far as the same can be accomplished between employer and employee in the most peaceable manner."

In stating his views on the question of the check-off—the retaining of union dues and assessments from the employees' wages to turn over to the union—the veteran miner voiced his protest on the ground that it was "unconstitutional and against the liberty and free will of every fair and intelligent wage earner."

His views on the disposition of the assessments, fees and monthly dues after they are collected by the check-off, were even more drastic. He pointed out that they could be used to create additional officials and to increase the salaries of the existing officials. "The whole amount of funds collected," he said, "could be used to further their careers and maintain their official positions irrespective of any protest presented by any local of the union which learned of any imposition by the officials in the shape of discrimination, graft or speculating with the funds."

"Not only these things are true," he continued, "but I have found from experience that political capacities are more or less maintained from union funds to promote any alleged union officials and have read of many who were back-sliders to that which they represented before their promotion.

"Verily, the same it is, and has been, with all boards of committees, commissions and investigations, when the hard and loyal wage earner is made an object to maintain any army of officials."

PENNSYLVANIA

Anthracite

Scranton—Among the graduates of the night school classes of the Scranton Technical High School on Mar. 12. was William C. Jones, aged 66, employed as a miner during the day, who has completed the night school course with an average of 82 per cent. He intends to complete the high school course.

Williamstown—Rescue work in recovering the bodies of John Welker and Harry Lynch, miners, who were killed by an explosion of gas in the old slope of the Williamstown colliery on Mar. 10, was completed on Mar. 12. Tons of rock and coal had fallen on top of the unfortunate men, and the work of recovery was exceedingly difficult and dangerous. The little mining town feels shocked after this accident, coming so soon after two other miners lost their lives by an explosion of gas three weeks ago. This makes five fatal and fifteen nonfatal accidents this year for the community.

Pittsburgh—The Public Service Commission has announced that the date for the argument in the matter of the complaint against the Philadelphia & Reading and Pennsylvania railroads as to the cost of transporting anthracite coal from the mines to Philadelphia, which was fixed for Mar. 30, has been postponed until Apr. 13. The postponement is necessary for the reason that some of the attorneys interested in the case have made prior engagements to appear before the Interstate Commerce Commission on the 30th.

Mar. 25 has been agreed upon as the date for argument of the action in equity brought by the Peoples Coal Co., of Scranton, to test the constitutionality of the anthracite coal tax act of 1913.

Bituminous

Pottsville—Joseph Jones, a timekeeper employed by the Lehigh Coal & Navigation Co., at Coaldale, on Mar. 9, pleaded guilty to four charges of embezzlement and one of larceny and was sentenced to two years in jail. By means of fictitious names placed on the pay-roll, Jones, in eighteen months, defrauded the company of $5400, using the money to speculate.

Pittston—Several graves in St. John's Cemetery have been affected by a cave-in at No. 2 mine of the Pennsylvania Coal Co. The cave-in is 40 ft. in diameter, and, owing to the fact that the ground is still unstable, it is impossible to remove the bodies. Officials of the company admit that the whole cemetery is undermined.

Wilkes-Barre—By a decision of Judge Garman, of the Luzerne County Court, in the famous suit of the Pennsylvania Central Brewing Co., against the Lehigh Valley Coal Co., over the destruction of an artesian well the court refuses a new trial and judgment notwithstanding the verdict to the defendants, thus sustaining the verdict of $8000 given the Brewing Co. for the destruction of the well.

The case was one of the most unusual tried in the lower courts in some years and was based on a conflict of surface and mining rights, the right of the plaintiff to the water under the ground from a well sunk on its property as against the right of the defendant company to mine its coal under the ground regardless of the well.

WEST VIRGINIA

Charleston—A classification of the 23 fatal accidents occurring in the West Virginia field during the month of February shows that four occurred on the outside and nineteen on the inside of the mines. Death came to nine from falls of slate and coal; six from car and motor accidents; two from electrocution; two from explosions; two from falls in the shaft; one from machinery, and one from the kick of a mule. Compared with the record of 38 deaths of the month previous and that of 33 for February, 1913, the Department of Mines has every reason to be encouraged by this report.

OHIO

Columbus—Lake vessels owned by Ohio companies come within the scope of the workmen's compensation act, and if their employees who are hired in Ohio are victims of accidents which happen in waters beyond the jurisdiction of the state, they are entitled to recover from the Ohio State insurance fund. If an employee of an Ohio corporation which pays into the workmen's compensation fund is injured or killed while in the performance of his duty in another state, recovery may be had under the compensation act. Should the employee elect to sue for damages in the outside state the company would be allowed to use the same defense it would have if the action were brought in Ohio.

Urban—John Downey, a well known coal dealer of this section, recently was shot and killed by George Lee, a tenant in one of his houses following a dispute.

Massillon—The tipple and power house of the Massillon-Elm Run Coal Co. near here were saved from destruction by fire recently when a neighbor started the pumps and quenched the flames. The fire started from a miner's lamp.

KENTUCKY

Whitesburg—W. H. Potter, of Mater, Ky., near this place, has leased 400 acres of fine coal land to Louisville and Cincinnati promoters for immediate development. The property lies around the mouth of Boone's Fork, on the edge of the main coal field in that section.

Frankfort—The House Committee on Mines and Mining has reported favorably a bill fixing the salary of the Chief Mine Inspector at $3000 a year and creating two additional assistants.

Lexington—State Mine Inspector C. J. Norwood, Perry V. Cole and T. J. Barr, comprising the State Board of Examiners for applicants for mine-foreman certificates, have issued 23 certificates to those who successfully passed the examinations begun Feb. 23, as follows: First-class, George Coburn, McRoberts; G. H. Darbyshire, Jenkins; John E. Dent, McRoberts; David J. Llewellyn, Jenkins; M. B. Mitchell, Raymond; C. F. Rainey, Warren, and W. R. Rainey, Warren. Second-class, H. S. Adkins, Rigley; J. C. Angel, Bradel; F. L. Long, Lower Greasy; F. F. McCoy, Warren; J. Dunn, Van Lear; Herschel Poge, Beach Creek; W. A. Ross, Warren; John D. Simpson, Excelsior; C. C. Ward, Williamport; George C. Wolfe, Van Lear. Four other applicants received third-class certificates, entitling them to act as foremen only in nongaseous mines employing not more than 25 men.

INDIANA

Evansville—It is understood that M. L. Albers, of 1 Liberty Street, New York, is endeavoring to secure several of the mines which were recently reported as being under option to the Deep Water Coal & Coke Co., with the idea of operating them before the opening of the Panama Canal. Albers is said to represent a New York syndicate.

OREGON

Portland—Word was received here from Seattle, Mar. 10, that title to a coal claim near Glacier, Whatcom County, estimated of great value, has been awarded by the United States Land Office at that place to six joint claimants: Mrs. Mary Wheatmar, Seattle; John P. Stuart, Blaine, Wash.; Harry C. Smith, Clarence C. Keplinger and Joseph M. Frankvitz, Bellingham, Wash., and Douglas H. Hinton, Glacier, Wash. Each owns 160 acres of the land, which is located in the forest reserve, about 140 miles from Seattle. The claims were filed in 1909. In 1911 the government brought action to annul the claims on the ground that the land was chiefly valuable for timber and not for coal. The final hearing came up Mar. 10. State Geologist Henry Landee, president of the state university; F. R. Whitlock, consulting engineer, and Charles Newhill, efficiency engineer, testified that the coal found was pure anthracite.

MISSOURI

Webb City—One miner was killed and one seriously, but not fatally, injured, when the hoist at the Burt-Robinson mine broke on Mar. 12. The men dropped about 200 ft. Charles Tow, 30 years old, was killed, every bone in his body being broken. Lewis Harris, 25 years old, probably will recover.

Princeton—Drillers on the Kesterson farm struck coal at a depth of 470 ft. The vein was about 5 ft. thick, and covered with about 2 ft. of slate. R. H. Brennan has leases on the land, and must bore five holes, according to the terms of his contracts. Railroad connections and other favorable factors have directed the attention of a good many operators to the Princeton field.

KANSAS

Frontenac—A good deal of interest was aroused here recently when a miner found a nail imbedded in a lump of coal mined at a depth of 50 ft. The nail, which was 2½ in. in length, and rusty, gave no indication of how it found its way into the ground at that depth.

OKLAHOMA

Huntington—The Central Coal & Coke Co., of this place, through the influence of Robert Barr, superintendent, has furnished each of its mines with a first-aid outfit, consisting of bandages, splints and other essentials, to be used to relieve the suffering of injured miners as much as possible before bringing them to the surface.

Oklahoma City—Operators of Oklahoma left for Washington recently to confer with government officials regarding the sale of coal lands in the McAlester field on which leases are held. Of the 438,000 acres of segregated Indian land to be sold, 100,000 is held by operators under 30-year leases, of which 18 years is to run. The operators wish to retain the leases and to secure departmental regulations for the protection of the land, regardless of their disposition. Included in the committee was W. E. Beaty, of the Dow Coal Co.; Carl Sholz, Rock Island Coal Co.; and J. H. Hibbon, superintendent of mines of the Missouri, Kansas & Texas Ry.

FOREIGN NEWS

Brussels, Belgium—Seven miners were recently drowned in a mine at Bracquegnies, near here, by the bursting into one of the galleries of a subterranean stream.

Ekaderinoslav, Russia—Twenty-four men were killed in an explosion of gas in a coal mine here on Mar. 8, caused by a miner opening his safety lamp in a gas-filled chamber in order to light a cigarette.

London, England—Heavy orders for German coal were recently placed by one of London's large gas companies. In connection with this, it is interesting to note that Berlin gas companies are also users of English coal, shipments of which are frequently sent up the Rhine as far as Mannheim, passing on their way within a short distance of the Essen coal region, probably the most important coal district on the continent.

CONSTRUCTION NEWS

Adamson, Okla.—The Dow Coal Co. is sinking a slope mine here, and expect to sink another shortly, and also to install a shaft at Savanna.

Newark, Ohio—The Dixie Coal Co. has purchased a tract of land along the B. & O. R.R. tracks and will start at once to erect large coal pockets for retail purposes.

Coal Hill, Ark.—Rafter Coal Co. will develop 153 acres of coal property acquired here, with a daily output of 150 tons. This company was recently incorporated as the Peoples Coal Company.

Nashville, Tenn.—The St. Bernard Coal Co., of Earlington, Ky., which recently acquired the plant and business of the Pinner Coal Co., is planning the erection of two additional screening plants in Nashville.

Columbus, Ohio—The New Pittsburg Coal Co., of Columbus, has received word that the Pittsburg Coal Co. will soon start the erection of docks at Allouez, Wis., which will cost $500,000 and require two years to complete.

Wasioto, Ky.—The Asher Coal Mining Co., recently organized with $60,000 capital, are beginning work on a first-class mining plant, near Wasioto, on the Cumberland Valley Division of the Louisville & Nashville. T. J. Asher is managing the new operation.

Harlan, Ky.—The Cumberland-Campbell Coal Co., recently organized at Welch, W. Va., by James B. Flannigan, Welch; Ely L. Glade, Chicago; J. M. Clay, Louisa; and J. W. Waldron and T. J. Flannigan, Welch, will start a million-dollar operation on Martin's Fork, near here, where they will build two good-sized industrial cities. Work to start within two weeks.

Pound, Va.—The Indian Creek & Pound River R.R., an extensive lumber carrier, makes the announcement that the road will be extended from Pound down Pound River to a connection with the Carolina, Clinchfield & Ohio R.R., now being completed through "The Breaks." The extension will be about ten miles long and will pass through a rich coal and timber section.

Bethlehem, Penn.—The Lehigh Coke Co. will shortly begin construction of a $4,000,000 plant for the manufacture of coke and coal byproducts to supply the blast furnaces and foundaries of the Bethlehem Steel Corporation. When completed the plant will be the second largest of its kind in the world, consisting of 424 ovens with a capacity for carbonizing daily 5000 tons of bituminous coal.

Fleming, Ky.—The Mineral Fuel Co. are getting well under way in the construction of their third industrial mining city on Yount's Fork four miles from Fleming, several hundred hands being at work. Already mining operations have been begun at two of the company's mines in Fleming. Two more mines will be in readiness immediately. The coal tonnage will be largely increased by April 1.

Gate City, Va.—The Clinch Mountain & Southern R.R. Co., with headquarters at Abingdon, Va., announces the building of a coal and lumber road from Gate City to Abingdon, 20 miles, construction of which is to start by April 1. The road will tap a large part of the rich timber holdings of the Clinchfield Coal Corporation where developments will soon start in the coal and timber properties. Construction will be rushed.

Hazard, Ky.—The Haley Coal Co. will begin operations immediately upon a mammoth coal mining plant on Lost Creek, seven miles from the main line of the Lexington & Eastern R.R. in Perry county, and have arranged with the L. & E. to build a spur line to the new development, construction of which is to start at once. This, according to information, will be one of the biggest coal operations in Perry county.

Newark, Ohio—The announcement is made by the officials of the Pan-American Coal Co., of this city, that extensive repairs and improvements will be made at the mines of the company located in several different mining districts of the state. It is proposed to install the Marcus picking tables, similar to those in use at the mines of the Pocahontas Coal Co., at Coalwood, W. Va. The nine mines of the Pan-American Co. have a capacity of 1600 tons daily.

Philadelphia, Penn.—The Lehigh Coal & Navigation Co., of this city, will add to the equipment of its mines at Lansford, Penn., six 15-ton and nine 8-ton electric mining locomotives manufactured by the General Electric Company. New electrical equipment for the No. 5 shaft at this colliery includes a 150-hp. induction motor, three 500-kv.a. transformers, control equipments, switchboards and accessories, which will also be installed by the General Electric Co.

St. Louis, Mo.—At the instance of the Laclede Gas Light Co., a bill recently was introduced in the St. Louis council, providing for the condemnation of nine streets on which the company wishes to establish a coke-manufacturing plant at an estimated cost of $1,500,000. The streets involved lie south of Broadway and south of Catlan St. in South St. Louis, adjoining the River Des Peres. No payment in consideration of the vacation of the property is provided in the bill.

INDUSTRIAL NEWS

Vinita, Okla.—C. C. Jenkins recently opened a stripping mine of 4 ft. of coal at his farm, two miles northwest of here. Prospecting is being done in that section by others interested in the situation.

Virginia City, Va.—The Virginia City Colliery Co.'s plant here, recently purchased by C. W. Lambert and William T. Williams, is being revived and extended with all latest improvements in modern machinery. They will begin shipping coal by Apr. 1.

Viper, Ky.—G. H. and Kemper Brashear have purchased the old Brasher coal-land tract, on Mace's Creek, near here, and will put in a $50,000 coal development, beginning work Apr. 1. A 1-mile spur line of the Lexington & Eastern R.R. will be built to the property.

Birmingham, Ala.—Protest against increased rates on coal from the Birmingham district to Memphis, Tenn., by the Frisco lines has been filed with the Interstate Commerce Commission by the Empire Coal Co. of Birmingham. It is claimed that these rates are higher by 10 cents per ton than for the same distance from Kentucky and Illinois.

Fleming, Ky.—The Mineral Fuel Co. here will open and begin active mining operation in five new mines at Fleming, Haymond and Yount's Fork by Apr. 1, and the output will be about doubled from the company's mines. Increases will also be made from time to time during the spring and summer months. Contracts were closed a few days ago for the entire output of the company's plants.

Pittsburg, Kan.—The Cherokee & Pittsburg Coal & Mining Co. has been made the defendant in a damage suit for $500. The plaintiff is Matthew Knowll, a farmer residing near Pittsburg. Mr. Knowll alleges that failure of the mine owners to have the mine entries under the farm propped. has caused his farm to sag and give way in certain places. He asserted further that the farm is now unfit for raising crops.

Cherryvale, Kan.—Smelting companies of Kansas, many of which were practically put out of business by inability to get gas or oil for fuel during the past winter, are, in several instances, trying crushed coal successfully for this purpose. The Edgar Zinc Co., of Cherryvale, has spent $100,000 in installing coal-burning kilns, and has resumed capacity operations, under the personal supervision of President S. C. Edgar, Jr., of St. Louis.

Pittsburgh, Penn.—A deal was consummated on Mar. 13, for a consideration of $6,000,000, whereby H. C. Frick bought 10,000 acres of coal lands in Perry Township, Greene County, Penn., from J. V. Thompson, of Uniontown. The deal was closed after Mr. Frick had completed the arrangements for the sale of his property on Sixth Ave. and Cherry Way to the Fort Pitt Hotel Co. A splendid hotel of 900 rooms will be built by the Fort Pitt people on the site purchased.

Columbus, Ohio—A new operating and jobbing concern which has opened offices in Columbus is Hatton, Brown & Co., which has main offices at Roanoke, Va. The Western branch is in charge of F. G. Hatton, president of the company, who will divide his time between the Columbus and Roanoke offices. It is the first effort of the company to enter the Western field. The company has mines in the Clinch Valley, Va., and controls the output of mines in the Pocahontas field in West Virginia and in eastern Kentucky. Another product is Wise County coke.

Whitesburg, Ky.—Contracts closed with the Northwestern Fuel Co., of Minneapolis, Minn., following a recent visit to the mines of the Consolidation Coal Co. by a number of officers of that company, calling for immediate delivery of large quantities of coal, have resulted in renewed activity at the mines, which is hampered only by a lack of labor. Manager E. Drennen stated recently that there is a marked scarcity of efficient labor, which is the more regretted on account of the fact that the company proposes to open a number of new mines during this spring and summer. All plants now open will run full time for the remainder of the year, it is announced.

New Orleans, La.—In order to facilitate the handling of coal in cargo lots for export, the dock commissioners have under consideration a plan for setting aside a well equipped wharf for the handling of coal. This will be a part of the general movement to increase the exports through this port. With the river furnishing cheap transportation to the greatest coal fields of the country, the dock board is of the impression that the providing of proper facilities at this port will result in a large cargo movement, especially after the canal is opened. It is pointed out that during nearly half the year weather conditions at Hampton Roads interfere with the handling of coal, while here there would be no such interruption.

PERSONALS

Patrick Quinn, superintendent of the Sunshine mines at South Fork, Penn., is to be chosen head of the Sterling Coal Co.'s operations at Bakerton to succeed the late John B. Reed.

Benjamin Reene, recently rounded out his 55th year of service in the mines. Starting at the age of 11 as a slate picker, he worked his way up to a mine foremanship, and is at present with the Cranberry Colliery of A. Pardee & Co. in that capacity.

B. R. Smith has been appointed joint sales agent for the Corona Coal & Coke Co., the Birmingham Fuel & Iron Co. and the Roden Coal Co., succeeding the late John R. Ryan, general sales agent for the two former companies, who died about two weeks ago.

H. A. Rapelye was recently appointed Sales Engineer in the Pittsburgh District for the Terry Steam Turbine Co., of Hartford, Conn. His offices are in the Oliver Bldg., Pittsburgh, Penn. Mr. Rapelye has had a broad experience with turbine apparatus, and has been for the past two years the commercial engineer of a company prominent in the field of prime movers and auxiliaries.

H. J. Meehan, who was recently appointed general manager of mines for the Cambria Steel Co., began his duties on Mar. 14. Mr. Meehan was formerly Superintendent for the Lackawanna Coal & Coke Co., at Wehrum, Penn. During the four or five years that he was with the Lackawanna Co., he increased its output from 400 tons to 2500 tons daily. Mr. Meehan's headquarters are at Johnstown, Penn.

J. L. Forepaugh has been appointed lake freighting agent of the North-Western Fuel Co. with offices in Cleveland. He succeeds A. E. Williams, who resigned last month. Mr. Forepaugh was formerly a division superintendent for the Great Northern R.R., and of late has been a traffic manager for the North-Western Fuel Co. in St. Paul, Minn., where the company has its principal office. The appointment of Mr. Forepaugh was effective March 1.

OBITUARY

James Anderson, vice-president and general manager of the Pacific Coast Coal Co., and engineer of the Pacific Coast Coal Co., died on Mar. 13, at his home in Seattle. Mr. Anderson was 58 years of age, and was considered an authority on coal mining in the Pacific Northwest.

William R. Borders, president of the Bank of Sparta, of Sparta, Ill., and president and general manager of the Boyd Coal & Coke Co., of Sparta, was one of the victims of the Missouri Athletic Club fire in St. Louis, in the early morning hours of Feb. 9, in which 29 or 30 other persons lost their lives. Mr. Borders was 55 years old and a bachelor, and had interests scattered all over the country. At the time he was on his way to Texas, having stopped over in St. Louis for the night. The remains were taken from the ruins on the 13th and the burial held at Sparta.

Fred Rainecke, secretary, treasurer and general manager of the Reinecke Coal Co., of Madisonville, Ky., died at St. John's Hospital in St. Louis, Monday morning, Mar. 9, where he had been confined for some time. Mr. Reinecke belonged to a family of pioneer coal operators in the Illinois field adjacent to East St. Louis, and located there many years ago with his father and brothers. Some few years ago they sold their Illinois interest and removed to the West Kentucky field, where their mining interests are among the most prosperous and uptodate in the entire field.

NEW INCORPORATIONS

Burnwell, Ala.—The Burnwell Coal Mining Co., with operations in Walker County, has increased its capital stock from $50,000 to $100,000.

Logan, W. Va.—The Iroquois Collieries Co. has been incorporated here by Edward H. Jewett, Leonard C. Davies, Richard B. Chase, Ray Cook, and Walter C. McMahon. The authorized capitalization is $3000.

Hazard, Ky.—The Well's & Day Coal Co. has been organized here by P. G. Wells, J. H. Wells and R. F. S. Day, with capital of $50,000, for the purpose of developing the rich Perry County field, around Hazard. This field is attracting considerable attention.

Fort Worth, Tex.—The Strawn Coal Co. has filed articles of incorporation, the capitalization being placed at $500,000. The incorporators and directors, each of whom subscribed to $100,000 of stock, are Paul Waples, L. H. McKee, W. Burton, J. L. Johnson and A. Deffenbach. The company will mine and market coal in Tarrant, Palo Pinto and other Texas counties, with headquarters at Fort Worth.

Whitesburg, Ky.—The Letcher County Coal & Development Co. has been organized here by James P. Lewis, Martin D. Lewis, James H. Frazier, Whitesburg, and George Hogg, Roxana, Ky., with a capital stock of $100,000, fully paid in. The company owns large areas of fine coal and timber properties in eastern Kentucky and proposes to spend thousands of dollars in the development during the spring and summer months. James P. Lewis is president, and James H. Frazier, secretary and treasurer.

CATALOGS RECEIVED

National Tube Co., Pittsburgh Penn. "The Proof is in There." Eight-page folder, 5x12 in., illustrating and describing modern soft-steel pipe vs. wrought-iron pipe.

National Tube Co., Pittsburgh, Penn. "N. T. C. Regrinding Valves." Fourteen pages, 2½x6 in., illustrating and describing the advantages of N. T. C. regrinding valves.

The J. C. Stine Co., Tyrone, Penn. The J. C. Stine Patented Disk Fans. Twenty-four pages, 8x6½ in., illus.

Chicago Pneumatic Tool Co., Chicago, Ill. "Chicago Coal Drills." Twelve pages, 6x9 in., illus.

Coal Trade Reviews

General Review

Cancellations the rule in anthracite and trade marking time pending opening prices. Possibility of a suspension in the soft-coal fields already discounted. Contracts renewed on the same basis as last year, but subject to a change in the wage scale.

In spite of the fact that mining in the hard-coal regions is under heavily curtailed production, the anthracite agencies are being swamped with cancellations of March orders. Consumers and dealers have sufficient of the domestic sizes on hand to carry them over until the spring discount goes into effect, Apr. 1, and the market is flat and devoid of any interest whatever. The trade is at a complete standstill, and simply marking time pending the opening prices. Individual operators are always offering coal at the April circular, but the large companies are contenting themselves with making preparations for the spring and summer business, which promises to be heavy. It is generally agreed on all sides that stocks on hand are at an abnormally low level, and a sharp rush for coal is expected Apr. 1, with a consistently active business thereafter.

The possibility of a suspension at the bituminous mines, lasting from four to six weeks, seems to have been already discounted. General conditions are obviously unfavorable, and only a vigorous curtailment can prevent a price recession; should the price-level break, there is little hopes of it being restored during the dull period the trade is now facing. Some little contracting is being negotiated on the same basis as last year, but subject to any change in the wage scale. The Pittsburgh district reports prices steady, with mine operations at close to full rated capacity, due probably to a general stocking against a possible suspension and also in part to a slightly greater consumption; neither an agreement nor continuation of mining pending a settlement of the wage-scale controversy is anticipated.

While the price-level in Ohio is being well maintained, there is an entire absence of snap, although this should be ordinarily a boom period in trade circles. The domestic business is particularly hard hit, dealers attempting to clean up stock rather than accumulate surplusses. Hampton Roads prices are steady at the full circular, while loading at the piers is somewhat heavier and a further improvement is anticipated next week.

There has been a profitable business in the Southern domestic coals, as a result of the colder weather, but a decided slump is anticipated when the spring opening occurs; the steam trade is already demoralized, and many mines have shut down until conditions improve. As a result of the milder weather in the middle-western market, the domestic demand has dropped off almost entirely, and retailers are showing little disposition to accumulate surplusses against a suspension in mining Apr. 1. This also applies to the steam trade with the single exception of the railroads which are stocking heavily.

EASTERN MARKET

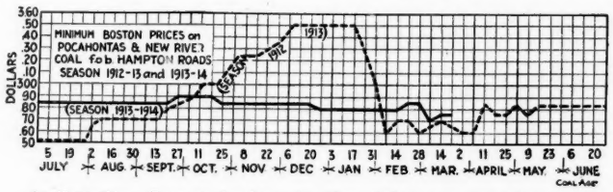
BOSTON

A dull period of 60 days or so still predicted. Less talk of concessions on contracts, while spot coal is practically at a standstill. Some demand for Pennsylvania grades but mostly for all-rail delivery. Water freights easy. Anthracite beginning to be loaded for April billing.

Bituminous—The general opinion of a fortnight ago that there would be little doing on contract business until after May 1 seems to be borne out by the state of trade so far this month. Aside from water freights being guaranteed at a minimum, there is little reason to suppose that any material concessions are being made from the $2.85 price f.o.b. Hampton Roads. If the price level should be reduced through over-anxiety on the part of any of the shippers it would be next to impossible to reëstablish the season basis in a year so dull as this promises to be. Spot coal is practically at a standstill, with no near prospect of improvement. New England buyers feel they can continue their waiting policy and perhaps make better purchases in May or June.

Only a relatively small volume of the Pennsylvania grade is coming forward in anticipation of a suspension in mining. Most of such supplies are coming all-rail; the tide-water market has shown rather less activity in that line. Shippers of the better known coals are sharing a fair amount of March business but the bulk of it is a hand-to-mouth matter.

Water freights are easy at 70@75c, Hampton Roads to Boston. The demand for tonnage is light, even some of the steamers being in the market for recharter. From New York for points on Long Island Sound rates are 45@50 cents.


MINIMUM BOSTON PRICES on POCAHONTAS & NEW RIVER COAL f.o.b. HAMPTON ROADS SEASON 1912-13 and 1913-14
DOLLARS
(SEASON 1913-1914)
(SEASON 1912-1913)
JULY AUG SEPT. OCT. NOV DEC JAN FEB MAR. APRIL MAY JUNE

Anthracite—Large dealers in the cities are running along on light stocks, hoping for early April deliveries. It is understood that the shipping companies have already begun to place barges for April billing. The volume of domestic sizes to be received here next month is expected to be heavy. The ice went out of the Sace River on Mar. 15, but the Penobscot and Kennebec will probably not open until Apr. 5 to 10.

There is some anxiety over the probable shortage in the supply of broken coal, and prices on that size are expected to be firm in all directions.

Current quotations on bituminous at wholesale are as follows:

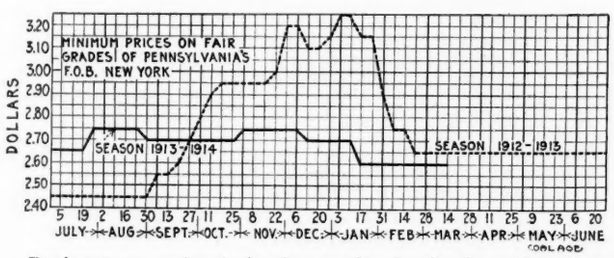
	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$0.95@1.50	$1.25@1.65	$1.67@1.77	
Philadelphia*	2.20@2.75	2.50@2.90	2.92@3.02	
New York*	2.50@3.05	2.80@3.20	3.22@3.32	
Baltimore*			2.85@2.95	
Hampton Roads*				$2.75@2.85
Boston†				3.78@3.83
Providence†				3.73@3.78

*F.o.b. †On cars.

NEW YORK

Bituminous trade fails to respond to the possibility of a suspension in mining. Spot market flat and little doing on new contracts. Nominal market on hard coal down to the April circular, and the trade marking time pending opening prices.

Bituminous—Contrary to what is normally the case, just before a possible suspension in mining, there is absolutely no snap whatever to the bituminous market. With the exception of some buying on the part of the Berwind Co., due probably to the delayed movement as a result of the inclement weather, there is practically no spot market whatever. This is rather remarkable in view of the fact that conservative interests look for a suspension of from four to six weeks, and it is evident that buyers are either skeptical of this or that such a condition has already been discounted.


MINIMUM PRICES ON FAIR GRADES OF PENNSYLVANIAS F.O.B. NEW YORK
DOLLARS
SEASON 1913-1914
SEASON 1912-1913
JULY AUG SEPT. OCT. NOV DEC JAN FEB MAR APR MAY JUNE

Business on contracts is also coming in slowly, with prices usually on the same basis as last year, but subject to any increase in the wage scale. A large tonnage of Fairmount coal for lake shipping is reported to have been closed. Demurrage coal is well cleaned up locally, but the loading at South Amboy is still reported slow.

The market is not quotably changed, and we continue on the same basis as last week, as follows: West Virginia steam, $2.50@2.60; fair grades Pennsylvania, $2.60@2.70; good grades of Pennsylvania, $2.70@2.80; best Miller Pennsylvania, $3.10@3.15; George's Creek, $3.15@3.25.

Anthracite—Hard-coal operations are heavily curtailed, while all agencies are being swamped with cancellations. The nominal market on the prepared grades is practically at the full April discount, rumors even being current to the effect that some of the larger companies are making such concessions; this is hardly possible, however, and more likely applies to orders being placed now for April delivery. There is plenty of individual coal, however, available at these figures.

As a rule, the steam grades are somewhat easier and more nearly normal, but the curtailment in mining is still resulting in reduced shipments, and there is an acute shortage in certain departments, notably pea and buckwheat, which are practically out of the market. The anthracite trade is now practically marking time, pending the spring opening, Apr. 1, at which time a heavy rush for coal is anticipated. In view of the reduced mining over the past few months, the feeling prevails generally that the stocks of hard coal are at an abnormally low point and an unusually active spring and summer business is anticipated. We quote the New York hard-coal market on the following basis:

	Upper Ports		Lower Ports	
	Circular	Individual	Circular	Individual
Broken	$5.00		$5.05	
Egg	5.25	$4.90@5.35	5.30	$4.75@5.30
Stove	5.25	4.90@5.35	5.30	4.90@5.30
Chestnut	5.50	5.35	5.55	5.25@5.55
Pea	3.50	3.50@3.75	3.50	3.50@3.75
Buckwheat	2.75	2.75@3.00	2.70@3.45	2.70@3.00
Rice	2.25	2.25@2.50	1.95@2.20	2.00@2.40
Barley	1.75	1.75@2.00	1.70	1.60@1.90

PHILADELPHIA

Anthracite business flat. Demand for steam sizes good, but domestic grades quiet. Mining curtailed. Bituminous improving; demand about the same as last week, but at slightly better prices.

Anthracite—The market for anthracite, outside of the steam sizes, has fallen flat. The winter weather of the past month has been followed by almost spring temperatures, and as the householders have laid in sufficient supplies to carry them over until the opening prices, very little can be expected in the movement of the domestic sizes. The demand for steam grades still continues good, and the stocks of these grades have been largely reduced during the past three weeks. Curtailed mining has in part been responsible for the apparent shortage in these sizes, and in some cases, premiums have been asked and received.

The latter half of the month of March has always proved a fertile field for the individual operators who desire to continue work at their mines, and a large quantity of coal will doubtless come to this market, billed at the April figures. The large companies, however, still insist upon March prices, and content themselves with filling up their order books, and preparing for the heavy rush which is bound to take place on Apr. 1. A canvass of the situation finds the dealers in splendid shape to handle coal. Their calculations are doubtless made to have present stocks almost depleted by the opening of April, in marked contrast with last year, when considerable high-priced coal was carried over. The present outlook is favorable for a good, early spring business.

Bituminous—Slight improvement marked the bituminous trade last week. The demand was on about a parity with the week previous, but slightly better prices prevailed. The restricted movement of cars has doubtless caused this, but the end of the week finds traffic in much better shape. Restricted production, however, still obtains at many operations, and the fear of demurrage finds little coal standing at tidewater without shipping orders.

BALTIMORE

Car shortage is being severely felt, much to the surprise of the trade. Spot sales at tide exceed the mine prices. Anthracite demand shading off, but both branches busy on contracts for the new year.

At a time when the car movement is generally the best of the year, a shortage is beginning to develop. During the past week a number of mines in West Virginia and in western Pennsylvania reported inability to get empties as desired or to get their loaded cars on the move to terminal points. Whether the general retrenchment policies of railroads is responsible, or some other cause, the fact remains that the movement on the Pennsylvania, Western Maryland and Baltimore & Ohio is below the high standard formerly set. As a result there have been days when there was a considerable shortage of fuel at the piers here, and some shippers have been forced to purchase coal above the market price. The situation as to prices at the mines remains unchanged and the general market is still flat and uninteresting.

The anthracite men are feeling the effects of the spring shading off in demand, particularly in the household trade. Both ends of the business, however, are now busy on new contracts. A fair number of consumers are already in the field for long-term contracts, and the figures quoted are reported the same as those of last April. This is considered a good omen for a prosperous summer in the trade.

While principally interested with the future, there is enough spot business for the operators to maintain existing prices. West Virginia gas coals are commanding from 75 to 85c. with the steam grades around 90 to 95c. but the better grades are easy at from $1.15 to $1.30.

Heavy foreign loadings continue. A number of charters for foreign account, principally for South and Central America, and the Mediterranean, were announced during the week.

BUFFALO

Fair anthracite trade for the season and supply now decidedly light. Bituminous moving a little more freely. Coke not active. Some uncertainty as to new agreement.

Bituminous—The demand for all grades of bituminous is a trifle more active, with slack more so than sizes, which has been the case for sometime and is likely to continue. Shippers hardly know why this is except that there does not appear to be any made yet in connection with the lake trade. Slack comes into the lake trade indirectly in the preparation of three-quarter, which is the favorite size in that business.

Some of the mines have increased their output considerably to meet a sort of spasmodic demand from customers who are afraid that they will need more coal if the miners go out for any considerable time. Shippers are very cautious in predicting either a strike or a suspension. In view of this uncertainty, sellers and buyers are protecting their interests as best they can. There has been some delay on account of snow in the mining districts. Usually there is some activity on account of preparing for the lake trade, but now it is thought that the upper-lake docks may show large amounts unsold when the lakes open. Quotations are fairly firm at $2.80 for Pittsburgh lump, $2.70 for three-quarter, $2.50 for mine-run and $2.25 for slack, with Allegheny Valley about 25c. lower.

Coke—There is no stir in the coke trade. Here and there some shipper will discover an indication of improvement, but it is usually found to be temporary. The Buffalo price is based on $4.50 for best Connellsville foundry. Furnace coke is very dull, but stock is scarcer.

Anthracite—The demand is good, considering that April is so near at hand. The shippers look for a steady dropping off from this time on, but they are not anxious, for the supply is light and has been for some time. The mines have not run at all actively for a month or so past, due in part to the deep snow and there is also no particular reason for activity just now. Dealers in independent anthracite have cleaned up their supplies at circular prices and now look for a season of quiet.

There is no activity yet in Buffalo harbor. One shipper has taken some tonnage, but the ice is still heavy. As a rule, the lake shippers have little or no coal yet and they do not look for any right away.

CENTRAL STATES

PITTSBURGH, PENN.

Operations much improved and prices notably stiffer as result of impending suspension. Neither settlement or continuation of operations expected. Prompt coke continues easy and contracts moderately good.

Bituminous—The hardening in prices noted a week ago has continued, until the market is fairly steady around the $1.30 basis for mine-run. Slack can be picked up at the old price of 90c. in some cases, but sales at $1 and even $1.05 are not uncommon. Domestic 1¼ in. is going at $1.55@1.65. The higher figure is understood to be the minimum of the leading interest, an advance to that price having been made last October. Mine operations have improved and some of the large interests are now running practically full, while the Pittsburgh district as a whole is probably operating at fully 75% of capacity. A small part of the increase in demand is attributed to increased consumption, but the major part is ascribed to stocking up against a possible or probable suspen-

sion of mining Apr. 1. The market is quotable as follows: Slack, 90c.@1.05; mine-run, $1.30; ¾-in., $1.40; 1¼-in. steam, $1.50; 1¼-in. domestic, $1.55@1.65 per ton at mine, Pittsburgh district.

The Interstate Joint Conference has been called by President John White of the United Mine Workers to meet in the Hotel La Salle, Chicago, Tuesday, Mar. 17. Coal operators refuse to make any predictions as to the outcome, but as a matter of fact there is little reason for expecting either a settlement or an arrangement to continue mining pending a settlement. The convention at Philadelphia lasted three weeks, or much longer than was expected. The Chicago convention has only two weeks and a day to the expiration of the present scale and it will probably put in all this time, since an adjournment with a disagreement would not look well before all the possible time had been used up.

Connellsville Coke—The market shows somewhat more strength. It has lately developed that several sales of round tonnages for second-quarter were made by the Producers Coke Co., in February, at $2, a price which has been withdrawn at least nominally. It is claimed that this interest is now sold up to an average operation of fully 50% of the plants represented, and will not sell any more coke except at an advance over $2. Other sellers are talking $2.10 and have some negotiations on. Prompt coke is quiet and is easier again, the stringency caused by bad weather being over. The market stands quotable: Prompt furnace, $1.90@2; contract furnace, $2@2.10; prompt foundry, $2.40@2.60; contract foundry, $2.40@2.60, per ton at ovens.

The "Courier" reports production in the Connellsville and lower Connellsville region in the week ended Mar. 7, at 345,690 tons, an increase of 31,820 tons, and shipments at 383,842 tons, an increase of 42,058 tons. The shipments appear to have exceeded production by 38,152 tons, attributed to the movement of stock coke by the leading furnace interest.

TOLEDO

Market very quiet and demand for steam coal light. Circular prices holding well. Track coal strong among domestic dealers.

Although it was anticipated that purchasing agents for the large factories would by this time have been incited to provide reserve stocks in anticipation of a shutdown, conditions in the market are still unchanged. Reports state that in some instances reserves are being held that were bought several weeks ago when prices had slumped badly. This is, however, not general.

On the other hand, there is still an optimistic outlook regarding the situation. The weather is moderating each successive day and in consequence the immediate demand for domestics has weakened. The cold weather although of short duration, was still sufficient to enable the dealers to unload all of their yard stock. For the past week track coal has been in good demand to fill waiting orders. It must be an immediate sale or none at all and dealers do not seem inclined to await mine shipments.

COLUMBUS

Even with the wage agreement expiring there is no general stocking movement. Trade is quiet, although a considerable tonnage of steam grades is moving. Domestic trade has fallen off.

The coal trade in Ohio apparently has little snap at this time, although many contend that a suspension of from 30 to 60 days can hardly be avoided. Buying to guard against a suspension is not active and the market appears dull during a natural boom period. Prices are not being cut, however, to force trade and the general tone of the market is fair under the circumstances.

One of the worst features is the falling off in domestic demand. With the coming of higher temperatures the domestic producing section of the state is at a standstill. Dealers have been trying to clean up their stocks rather than to accumulate and this move has left them in good shape for the summer months.

The impression prevails that steam users, in case of a cessation of mining in Ohio will be able to get their fuel supply from West Virginia and there is a lack of buying for stocking purposes. Then, again, many of the steam consumers accumulated stocks during the past two months by permitting their usual requisitions to come forward, even when consumption was at a low ebb.

The railroad situation has improved to a certain extent, but the motive power on most of the roads is in bad shape and consequently the movement is not rapid. In the Hocking Valley district the output is estimated at about 75% of the average. In the Pomeroy Bend most of the mines worked full time and a normal production is recorded, but in eastern Ohio the output has been about 65%, and the same is true of the strictly domestic fields.

Quotations in the Ohio fields are as follows:

	Hocking	Pittsburgh	Pomeroy	Kanawha
Domestic lump	$1.50@1.40	.....	$1.50@1.45	$1.50@1.40
¾inch	1.35@1.30	$1.20@1.15	1.35@1.30	1.35@1.30
Nut	1.25@1.20	.....	1.30@1.25	1.25@1.20
Mine-run	1.15@1.10	1.10@1.05	1.15@1.10	1.15@1.10
Nut, pea and slack	0.85@0.80	.....	0.90@0.85	0.80@0.75
Coarse slack	0.75@0.70	1.00@0.95	0.80@0.75	0.70@0.65

CLEVELAND

Market suffering from a surplus of coal and spring-like weather. Retail trade at a low ebb and the wholesale has no outlet. Prices are running below cost in many instances.

All last week coal was a drug on the market. Stocking has been carried about as far as the manufacturers intend to go. The jobbers and operators have more real coal on hand than they can move and concessions are the rule rather than the exception. Monday the situation was worse than last week because of the large receipts. Youghiogheny slack was being offered at $1.95 by a local operator, who had a number of cars on track and he would have sold 5c. under that price to have moved it last Saturday.

As there are few boats available, it is not likely much, if anything, will be loaded until after the navigation season officially opens, Apr. 15, and really not before May 1.The attempt to charter tonnage for the entire season at 25c. to the fast docks on Lake Superior seems to have failed, and it is understood 27½c. is being offered. The fact that the shipper is willing to meet the vessel owners half way means none of the boats can be had at the lower rate and the prospects of a 30c. rate are good.

Reports received from Duluth-Superior state that the coal shipments during the first half of March have been normal. The February business was good because the temperature averaged ten degrees below normal. It is estimated by the fuel agent of one of the largest railroad systems in the Northwest that the docks at Duluth-superior are holding between 3,000,000 and 4,000,000 tons of coal.

Sales on the spot market were made at the following prices last week and Monday:

	No. 8	Middle District	Pocahontas
Lump, 1½ in.	$2.05*	$2.00*	$3.10@3.15
Lump, ¾ in.	2.00@2.05	1.95	
Egg	.....	....	3.10@3.13
Mine-run	1.90	1.90	2.60@2.75
Nut	2.00@2.05	1.95	
Slack	1.85	1.75	2.25@2.35

*None on track.

DETROIT

Colder weather cleaned up stocks while delayed movement has restricted supplies and there is a somewhat better tone to the market. No general stocking in anticipation of a strike.

Bituminous—There is somewhat of an improvement in the local market, although the price level remains practically unchanged, except on some of the best grades. Slack is commanding a fair price, while the domestic grades are naturally somewhat softer as a result of the milder weather. The extreme cold weather of a few weeks ago did much to clean up the surpluses, and there is a rather slow movement on the railroads, which is keeping the tonnages available at a low point. Embargoes on the Big Four and congestions on other lines are reported.

While consumers as a rule are ostensibly refusing to buy, in anticipation of a shutdown Apr. 1, it is noted that there are some making extensive preparations against such a contingency. Contracts for the new year are being renewed on the same basis as for the last period, but it is reported that little new business has developed. The new circular on Pocahontas and New River is as follows: Lump and egg, April, $1.60; May, $1.70; June, $1.90; July, $2; August, $1.25. Mine-run from April to August is quoted as $1.25, and $1.40 beyond August.

Anthracite—The milder weather has resulted in a reduced demand for hard coal, and it is reported that there is considerable on demurrage.

Coke—The coke trade is quite active. The Semet Solvay Co. is reported considerably behind on orders, and although prices have not improved as yet there is a strong undertone. Connellsville foundry is quoted at $2.40, Semet Solvay at $3.25, and gashouse at $2.90, all f.o.b. ovens.

HAMPTON ROADS

Demand for spot coal improving somewhat and fair shipments being made on contracts. Principal foreign shipments during the week to Naples and Genoa.

Dumpings during the week have not been extra but are somewhat larger and it is believed conditions will greatly improve during the coming week. Barge and steamer loading for the New England market has been fair with some large shipments moving to foreign ports.

Prices on all grades still remain at circular, foreign shipments selling about $2.80 to $2.90 for New River and Pocahontas and the demand for these grades showing up considerably better. There is, however, practically no movement of either high volatile or prepared grades. Export coal for the week has moved to La Plata, Rio de Janeiro, Canal Zone, St. Lucia, Genoa, Naples, Kingston, Para, Ceres and Manos.

A record loading was made by the Norfolk & Western Ry. at their new pier at Lamberts Point on Mar. 9, when they loaded 6000 tons of cargo and bunker coal into the S. S. "Fedora" between the hours of 8 a.m. and 3 p.m. and it is believed that when this pier is working properly that much better work will be accomplished.

LOUISVILLE, KY.

Continued cold weather, with snow, has held business up with the retailers, but the advance of the season has cut down the demand with operators, who find orders diminishing. Weather is moderating.

Ane entirely unexpected snowstorm early last week resulted in a continuation of active business with retail coal dealers in this section, although hand-to-mouth buying was general on the part of domestic consumers. The retailers, in their turn, have resorted to the same plan, many of them retiring from the market with small supplies, purchased within the past week or so. In consequence, there is at present only a light movement, and operators find themselves in much the same condition as before the February cold snap came to their rescue.

Strike talk is common, and the hope is freely expressed that there will at least be a suspension in order to strengthen the market. Prices have not reached any higher level than that of the past few weeks, $1.50 being about the top of the market for first-class block. The steam market is in fairly good shape, with the lessening supply of screenings, 80 and 85c. being the price for the better grades of nut and slack.

SOUTHERN AND MIDDLE-WESTERN

BIRMINGHAM

Demand for lump coal much larger but steam coal quiet. Both furnace and foundry coke dull. Pig iron sales not so large as last week. Car supply ample.

The continued cold weather throughout the South has materially aided the lump-coal business, as there was practically no stocks in the yards, and, as the demand was quite heavy on the retail dealers, the operators reaped a substantial benefit. However, as practically all the cold weather is over, it is expected that lump will now take a decided slump until the spring buying sets in at the lower prices.

Conditions on steam coal are far from satisfactory. The coast business is not what it should be, and the market in general is greatly demoralized. Many of the mines are running on short time, and some are even shut down entirely until conditions change for the better. However, the operators expect an improvement within the next 30 days. With all the adverse conditions, however, prices on steam coal are holding up remarkably well.

The market on both furnace and foundry coke is still quiet, all orders being for small tonnage only. Blacksmith coal is in a satisfactory condition, the price being firm at $2 to $2.25 per ton f.o.b. mines. The furnaces report that a very small tonnage of iron was booked during the last week as compared with the last few weeks but that the price was slightly over the $11 mark for 2 foundry f.o.b. Birmingham. On account of the exceedingly small shipments of coal and coke, the car supply is not a factor at this time.

NEW ORLEANS

Continued low temperatures help move the domestic grades but heavier demand fails to increase prices. New wharf to handle cargo business being considered.

Owing to the mildness of the winter it looked, the first day of February, as if large piles of coal would be carried over. Most of the cold weather of the winter, however, has come since that date and stocks have been greatly reduced. Supplies are still above normal and there has been no tendency to depart from the reduced prices that went into effect shortly after the first of the year. With the passing of present cold spell there is little hope of any further domestic demand this winter. From now until the discount season there will be little activity in the local market. Despite the large stocks some coal is coming down the river from Pittsburgh and Kentucky.

CHICAGO

Moderate weather and market quiet but supported by fairly good buying for storage purposes. Producers are awaiting for Apr. 1 to develop some change in the situation.

The comparatively warm weather and the fact that winter is about over has resulted in quiet conditions. The retailer is not stocking up now, preferring to take his chances at getting coal at the April discount. Apartment houses, the principal users of smokeless, have been permitting their stocks to run down low, but strength is added to the market by the cleaning up of demurrage coal, with companies getting $1.40 for mine-run and $2.25 for lump and egg, with some shading on both figures. If mine-run is up to demurrage it has been disposed of as low as $1.25, while the forcing of lump and egg brings the price for the latter below $2.

The demand for Hocking has been unusually quiet with the price maintained at $1.50. The splint situation is still unsettled as the result of shipping this coal in open cars by consignment to Chicago. A large bulk of this grade has sold at from $1.40 down to $1.10 and $1, but the circular price is $1.50. Franklin County coal is selling at $1.50 circular when it is shipped direct from the mine, while coal up to demurrage is less than $1.25. The Carterville situation is practically the same with quotations of from $1.40 to $1.50. There is an active steam demand in the Springfield market and Indiana dealers are reaping the benefit of a strike scare. The coke market is rather soft for domestic but strong for the hard coke.

Prevailing prices at Chicago are:

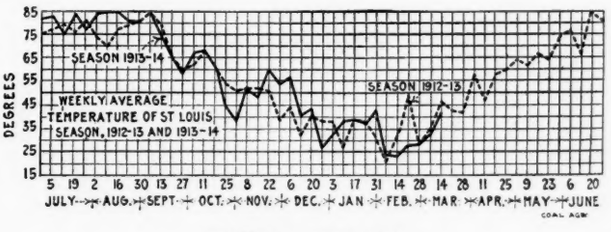
	Springfield	Franklin Co.	Clinton	W.Va.
Domestic lump	$2.07@2.17	$2.55@2.65	$2.12@2.27	
Steam lump	1.97		1.97	
Egg		2.55@2.65		$4.30
Mine-run	1.87	2.20@2.25	1.87	3.45
Screenings	1.67@1.77	1.90@2.05	1.67@1.77	

ST. LOUIS

Railroads doing considerable stocking but the average steam consumers very little. No strike expected but a suspension of some duration anticipated.

The domestic demand has practically ceased, and few of the companies are laying in storage coal. During the past week, however, the railroads became open about their buying in both the Carterville and Standard fields, and a large tonnage is now moving for railroad storage. The crisis will come as a result of the conferenee in Chicago and it is impossible at this time to determine what action they will take. It is likely, however, that there will be no strike, but that there will be a suspension. This will cause a general advance in prices, on account of the certainty of having to place orders for storage coal.

The screenings market is in a healthy condition, Standard screenings selling at from 65 to 70c., and Carterville at from 85 to 90c., with indications that both grades may do from 5 to 10 or 15c. better almost any time. Otherwise there has been practically no change in prices and the washed market is still weak. The Nos. 3, 4 and 5 sizes are in good demand, with No. 5 at 75 to 80c., and Nos. 3 and 4 at $1.25 and $1.35. Nos. 1 and 2 are offered freely and hard to move at $1.25. With screenings at $1 this will open the way for outside coal from the Kentucky field, and the coming week may see considerable of this brought in.


DEGREES
85
75
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SEASON 1913-14
SEASON 1912-13
WEEKLY AVERAGE TEMPERATURE OF ST LOUIS SEASON, 1912-13 AND 1913-14
5 19 2 16 30 15 27 11 25 8 22 6 20 3 17 31 14 28 14 28 11 25 9 23 6 20
JULY AUG. SEPT. OCT. NOV. DEC. JAN FEB. MAR APR. MAY JUNE
COAL AGE

KANSAS CITY, MO.

Arrival of spring weather has shut off buying. Mine operations reduced to 50% capacity.

The arrival of spring has tended to cut down demand from retailers. Dealers, while having light stocks on hand, are not inclined to order heavily in view of the warm weather, and operators of the Southwest must now rely on other than domestic consumption for business.

Operations at the mines have been reduced to about half time as the result of recent unfavorable developments. The prospects are for this average to be maintained for some time to come. No change has been made in quotations. Sales offices are still selling from track, but this method is likely to be eliminated in the immediate future.

OGDEN, UTAH

Market conditions weak. Spring weather prevailing from Omaha to Pacific Coast. Surplus of nut coal at mines. Quotations unchanged and unsteady.

The mines in Wyoming and Utah have reduced operations to summer basis on account of the weak market and the mine that is able to work half time is fortunate. The mild winter is being followed by an early spring and no doubt the market will continue weak for some time. At present there is a surplus of nut coal at the mines, but it is hoped the early spring will create a demand for this grade of coal as it makes a good warm weather fuel.

	California	Nebraska	General
Lump	$3.00	$2.75	$2.75
Nut	2.50	2.00	2.25
Mine-run	1.85	1.75	1.85
Slack	1.00	1.00	1.00

PORTLAND, ORE.

Winter's trade over and has been a poor year. But coal consumption on whole is increasing.

Winter is now practically over here. The weather has been unusually mild in the Pacific Northwest all winter and hence the demand for coal for domestic purposes has been light, although new uses for coal has probably resulted in an increase in the total consumption.

A regular line of steamers has been established between Portland and points in southeastern Alaska and it is expected that these steamers will call at the Vancouver Island collieries for return cargoes. This will probably affect the fuel situation to some extent here next winter. With freight rates more reasonable the demand for coal here will be increased, it is agreed by all dealers, for under existing conditions little fuel of quality is obtainable at less than $9.

PRODUCTION AND TRANSPORTATION STATISTICS

BITUMINOUS COAL MOVEMENT

The following is a summary of the movement of coal and coke over 13 principal railroads during December and the twelve months of 1913 in comparison with 1912, in short tons:

	December		12 Months ending December 31	
Anthracite	1912	1913	1912	1913
Baltimore & Ohio[1]	179,705	118,264	1,613,190	1,516,916
Chesapeake & Ohio[1]	1,541	681	23,450	16,545
Erie[3]	680,141	794,562	7,537,623	8,811,114
Pennsylvania[1 3]	1,036,717	1,012,125	10,312,348	10,711,335
Virginia[2 1]	103	86	283	1,045
Total 5 roads	1,898,207	1,925,718	19,486,894	21,056,955
Bituminous				
Baltimore & Ohio[1]	2,796,924	3,183,145	34,128,269	36,915,385
Buffalo, Roch. & P.[1 2]	719,733	816,981	8,289,296	9,723,992
Buffalo & Susq.[1 2]	138,944	141,895	1,530,441	1,787,551
Chesapeake & Ohio[1]	1,266,503	1,438,367	17,011,888	17,155,233
Erie[3]	8,107	10,389	266,150	350,590
Hunt. & Br'd T. Mt[1 2]	150,771	110,411	1,277,180	1,352,721
New York Central	826,281	806,572	8,308,260	9,220,689
Norfolk & Western[1 2]	1,697,488	1,835,823	22,643,169	23,892,469
Pennsylvania[1 3]	4,271,702	4,354,729	46,434,187	51,526,267
Pitts. & Lake Erie[1 2]	928,090	869,360	11,424,681	12,783,389
Pitts. Shaw. & North[1 2]	210,473	264,145	2,026,010	2,799,308
Virginia[1 2]	317,405	364,937	3,584,009	4,555,331
Western Maryland	198,102	175,311	2,767,980	2,953,601
Total 13 roads	13,530,523	14,472,065	159,691,520	175,016,526
Coke				
Baltimore & Ohio[1]	416,296	269,998	4,783,821	4,281,240
Buffalo, Roch. & P[1 2]	53,461	27,559	550,436	500,230
Buffalo & Susq.[1 2]	25,291	23,351	280,489	301,475
Chesapeake & Ohio[1]	23,544	33,079	260,847	361,535
New York Central	7,173	.....	87,758	36,207
Norfolk & Western[1 2]	134,763	117,305	1,469,618	1,530,384
Pennsylvania[1 3]	1,242,882	880,962	13,371,345	13,892,825
Pitts. & Lake Erie[1 2]	589,561	470,912	6,321,154	6,710,138
Pitts. Shaw & North[1 2]	2,004	.....	7,159	9,383
Western Maryland	5,927	4,801	70,351	73,346
Total 10 roads	2,500,902	1,827,967	27,202,978	27,696,763
Coal and Coke, 13 Roads				
January			16,421,839	18,936,646
February			17,787,331	17,546,496
March			19,483,025	17,631,346
April			13,429,367	16,850,395
May			15,635,568	18,986,790
June			16,702,153	18,580,366
July			16,635,448	18,704,713
August			18,396,247	19,718,850
September			17,432,358	19,046,247
October			18,712,657	20,611,176
November			17,815,767	18,931,169
December			17,929,632	18,225,750
Total, 12 months			206,381,392	223,770,244

[1] Includes coal from connecting lines.
[2] Includes company's coal.
[3] Does not include company's coal hauled free.
Note:—The Southern Railway hauled 373,994 short tons of bituminous coal during November, 1913, and 3,869,715 short tons during the 11 months ending November 30, 1913.

NORFOLK & WESTERN RY.

Following is a comparative statement of the N. & W. tonnage for February, 1913 and 14:

	Shipped		Tipple		Total	
Field	1914	1913	1914	1913	1914	1913
Pocahontas	869,596	793,880	16,691	17,158	886,287	811,038
Tug River	201,007	192,545	3,067	3,809	204,074	196,354
Thacker	191,755	252,527	6,473	8,955	198,228	261,482
Kenova	64,371	64,018	7,030	9,173	71,401	73,191
Totals	1,326,729	1,302,970	33,261	39,095	1,359,990	1,342,065

Shipments of coke, entirely from the Pocahontas field, were 64,610 tons in February of this year as compared with 121,058 last year.

THE CAR SITUATION

American Ry. Association reports surpluses and shortages of coal equipment for two weeks ended Mar. 1, as follows:

	Surplus	Shortage	Net*
New England Lines	128	0	**128**
N. Y.; New Jersey, Del.; Maryland; Eastern Penn.	12,243	0	**12,243**
Ohio; Indiana; Michigan; Western Pennsylvania	28,539	129	**28,310**
West Virginia, Virginia, North & South Carolina	5,372	900	**4,472**
Kentucky, Tenn.; Miss.; Alabama, Georgia, Florida	4,543	23	**4,520**
Iowa, Illinois, Wis., Minn.; North & South Dakota	4,019	42	**3,977**
Montana, Wyoming, Nebraska	1.517	0	**1,517**
Kansas, Colorado, Missouri, Arkansas, Oklahoma	3,289	0	**3,289**
Texas, Louisiana, New Mexico	614	0	**614**
Oregon, Idaho, California, Arizona	4,558	200	**4,358**
Canadian Lines	0	0	0
Total	64,822	1,394	**63,428**

	Nov. 1	Nov. 15	Dec. 1	Dec. 15	Jan. 1	Jan. 15	Feb. 1	Feb. 15
Surplus	6,720	10,520	17,621	36,435	72,535	87,149	85,489	84,775
Shortage	12,595	8,477	5,095	2,295	57	789	102	239
Net*	5,875	**2.043**	**12,526**	**34,140**	**72,478**	**86,360**	**85,387**	**84,536**

***Bold face** type indicates a surplus.

FOREIGN MARKETS

GREAT BRITAIN

Mar. 6—Irregular conditions are again in evidence. Steamers are being much delayed by stormy weather, and stocks of coal are heavy. Buyers in a position to take immediate delivery, are able to secure easy terms for most qualities. Colliery owners regarding the difficulties as only temporary, are unwilling to modify prices for forward loading. Quotations are approximately as follows:

Best Welsh steam	$4.50	Best Monmouthshires	$4.14
Best seconds	4.38	Seconds	4.02
Seconds	4.14	Best Cardiff smalls	2.64
Best dry coals	4.38	Seconds	2.52

The prices for Cardiff coals are f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are net f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days.

ITALIAN COAL CONTRACT

Contracts for supplying about 750,000 tons of coal for the Italian State Railways during 1914 have gone to Cardiff, Wales, and the price is to be $3.89 to $4.01 per long ton f.o.b. Cardiff. The coal is to be best Monmouthshire.—"Daily Consular Reports."

FOREIGN TRADE OPPORTUNITIES

The United States Consular Service reports opportunities in foreign coal markets as follows; complete details regarding different items can be obtained on application to the Bureau of Foreign and Domestic Commerce, Washington, D. C., by giving numbers:

Canada—It is reported that a bill was recently enacted by the Canadian Parliament to exclude French steam trawlers from ports in Canada where they now go to coal. If this law becomes effective, it is proposed to establish a coal depot for the trawlers, and it is possible that this depot will be supplied with coal from the United States. An American consul has already furnished some particulars in regard to American coal, but the administrator of the port desires to procure as soon as possible all available information regarding the price of coal f.o.b. Norfolk, under contracts calling for about 40,000 or 50,000 tons of coal per annum.—**No. 11,870.**

Europe—A member of a business firm in a European country informs an American consular officer that he desires to be placed in communication with American exporters of coal, with the object of representing them as agent. Correspondence may be in English. Prices, terms, discounts, etc., are desired. References can be furnished.—**No. 11,931.**

Index of Coal Literature

We will furnish a copy of any article (if in print) for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order.

BRIQUETTES

Fuel-Briquetting Investigations. C. L. Wright. Bureau of Mines, Bull. 58; 266 pp., illus.

The Briquet for Saving Fuel Waste. D. A. Willey. Coll. Engr., February, 1914; 2 pp., illus. 35c.

COAL DUST

British Coal-Dust Precautions. C. F. J. Galloway. Coll. Engr., March, 1914; 2½ pp. 35c.

French Coal Dust Precautions. P. Dunaime. Coll. Engr., February, 1914; 4¼ pp., illus. 35c.

Wet-Peat Zones for Arresting Coal-Dust Explosions. R. Cremer. Iron Coal Tr. Rev., Feb. 20, 1914; ⅝ p., illus. 40c.

COKE

A Westphalian Byproduct Coking Plant which also Supplies Town Gas. (Abstract of Paper by L. D. Ford read before the North of England Inst. of Min. & Mech. Engrs.) Iron Coal Tr. Rev., Feb. 20, 1914; 1¼ pp., illus. 40c.

A New Type of Coal Compressor. (Meguin's Magnetic Stamping Machine.) Gas Wld., Feb. 7, 1914; 1¾ pp., illus. 40c.

Coal- and Coke-Handling Machinery as Applied to Horizontal Retorts. (Discussion.) Gas Wld., Feb. 28, 1914; 2¼ pp. 40c.

Coke Oven Gas for Gas Engines. (Paper by Heinrich J. Freyn presented at the Feb. meeting of the A. I. M. E.) Iron Tr. Rev., Mar. 5, 1914; 2 pp. 25c.

Coke-Oven Gas for Power Purposes. Coll. Engr., February, 1914; 1½ pp., illus. 35c.

Byproducts vs. Beehive Coke Ovens. Henry S. Geismer. Coal Age, Feb. 28, 1914; 2 pp. 10c.

Metallurgical Coke. A. W. Belden. Bureau of Mines, Tech. Paper 50; 40 pp., illus.

The Automatic Control of Byproduct Coke-Oven Plants—III. A. Thau. Gas Wld., Feb. 7, 1914; 2 pp., illus. 40c.

DRAINAGE, PUMPING, ETC.

New Pumping Plant at Burley Colliery. (The new pumps are installed in duplicate in a roomy pump house about 90 yd. from the pit-bottom, taking the place of the steam driven pumps installed at the pit-bottom and delivered to a lodgment, the final lift being made by a Cornish pump installed on the surface.) Iron Coal Tr. Rev., Jan. 30, 1914; ⅝ p., illus. 40c.

Unwatering Old Workings at Middletown Colliery. (Paper by Cecil Hinchliffe read before the Yorkshire Branch of the Natl. Assn. of Coll. Mgrs.) Iron Coal Tr. Rev., Jan. 30, 1914; 3 pp., illus. 40c.

The Oneida Drainage Tunnel. A. H. Lewis. Employees' Mag., January, 1914; 3½ pp., illus.

ELECTRICITY

A Draw-Out Mining Switch Pillar. Coal Age, Feb. 14, 1914; 1¾ pp., illus. 10c.

Direct-Current Fields. (Discussion of some of the difficulties encountered in the operation of direct-current machines and some emergency cures.) Coal Age, Feb. 28, 1914; 1 p. 10c.

Electricity in Mines. (Paper read by Robt. Nelson before the No. Staffordshire Inst. of Min. & Mech. Engrs.) Coll. Guard., Feb. 6, 1914; 1 p. 40c.

Electricity in Mining. E. B. Wagner. Employees' Mag., January, 1914; 1½ pp., illus.

Explosion-Proof Mining Switch Gear. Coal Age, Feb. 28, 1914; 1 p., illus. 10c.

Hydro-Electric Power for West Virginia Collieries. C. A. Tupper, Coal Age, Feb. 7, 1914; 3 pp., illus. 10c.

Purchased Power and Bituminous Coal Mining. A. E. Rickards. Coal Age, Feb. 7, 1914; 5¼ pp., illus. 10c.

Speed Control of Electrical Motors. Coll. Guard, Feb. 13, 1914; 2 pp., illus. 40c.

The Action of Acid Mine Water on the Insulation of Electric Conductors. (A preliminary report.) H. H. Clark and L. C. Ilsley. Bureau of Mines, Tech. Paper 58; 19 pp., illus.

The Application of Electric Motors to Shovels. H. W. Rogers. Bull. A. I. M. E., February, 1914; 10½ pp., illus.

Use of Alternators in Parallel. C. A. Tupper. Iron Tr. Rev., Mar. 5, 1914; 8 pp., illus. 25c.

EXPLOSIONS

Auckland Park Colliery Explosion. Jas. Ashworth. Coll. Engr., February, 1914; 1⅜ pp. 35c.

Explosions in Mines. (Lecture by Prof. H. B. Dixon.) Coll. Guard., Feb. 13, 1914; ⅜ p. 40c.

Stone-Dusting at Bentley Colliery: Report to the Doncaster Coal Owners' (Gob Fires) Committee. (Paper read Feb. 21, 1914, by Robt. Clive before the Midland Inst. of Min., Civil & Mech. Engrs.) Iron Coal Tr. Rev., Feb. 27, 1914; 5 pp., 7 tables. 40c.

The Automatic Distribution of Stone Dust by the Air Current. (Abstract of paper by H. W. Halbaum read Feb. 14 before the North of England Inst. of Min. & Mech. Engrs., and Discussion.) Iron Coal Tr. Rev., Feb. 20 and 27, 1914; 2½ pp., illus. 80c.

The Explosion at Ravenwood, Colo. Samuel Dean. Coal Age, Mar. 7, 1914; 1½ pp., illus. 10c.

The Senghenydd Disaster. (Continuation of inquiry conducted by the Home Office.) Coll. Guard., Feb. 13 and 20, 1914; 3 pp. 80c.

FUEL TESTING

Coal and the Chemistry of its Carbonization. (Paper read by Dr. John Harger before the Liverpool section of the Soc. of Chem. Indus.) Gas Wld., Feb. 14, 1914; 1½ pp. 40c.

Miscellaneous Analyses of Coal Samples from Various Fields of the United States. U. S. Geol. Sur., Bull. 531, 1913; 4 pp.

The Microscopical Examination of Coal, Especially in Respect to Spontaneous Combustion. (Address by James Lomax before the Lancashire Branch of Natl. Assn. of Coll. Mgrs. and Discussion.) Iron Coal Tr. Rev., Feb. 27, 1914; 1⅜ pp. 40c.

GENERAL

Alaskan Coal Fields; Their Possibilities and Their Plight. J. Esdaile Florance. Eng. Mag., March, 1914; 10 pp., illus. 35c.

Coal at Horseshoe and Jerusaleum Valley, Boise County, Idaho. C. F. Bowen. U. S. Geol. Sur., Bull. 531, 1913; 6 pp., illus.

Coal Resources of Cowlitz River Valley, Cowlitz and Lewis Counties, Washington. A. J. Collier. U. S. Geol. Sur., Bull. 531, 1913; 7 pp., illus.

Coal in the Tertiary Lake Beds of Southwestern Montana. J. T. Pardee. U. S. Geol. Sur., Bull. 531, 1913; 15 pp., illus.

Mines and Mine Management: Past and Present. (Paper by John McLuckie read before the Scottish Branch of Natl. Assn. of Coll. Mgrs.) Iron Coal Tr. Rev., Feb. 20, 1914; 1¼ pp. 40c.

Prospects for Workmen's Compensation in Kentucky. G. D. Crain, Jr. Coal Age, Feb. 28, 1914; 1½ pp. 10c.

Status of the Coal Industry. (Address by Thos. L. Lewis at the banquet of the Coal Min. Inst. of Amer.) Coal Age, Feb. 21, 1914; 2 pp. 10c.

Surveying Methods of the Consolidation Coal Co. A. W. Hesse. Coal Age, Feb. 21, 1914; 3 pp., illus. 10c.

The Value of a Technical Training to Underground Workmen. (Paper read by Prof. W. H. McMillan before the Natl. Assn. of Coll. Mgrs.) Coll. Guard., Feb. 13, 1914; ¾ p. 40c.

Use and Abuse of Wood in Anthracite Mining. (Abstract of paper by E. E. Reuter read before the recent meeting of the Panther Valley Min. Inst.) Coal Age, Feb. 21, 1914; 3¾ pp., illus. 10c.

GEOLOGY

The Barber Coal Field, Johnson County, Wyoming. Carroll H. Wegemann. U. S. Geol. Sur., Bull. 531, 1913; 21 pp., illus.

The Cerrillos Coal Field, Santa Fé County, New Mexico. Willis T. Lee. U. S. Geol. Sur., Bull. 531, 1913; 27 pp., illus.

The Coaldale Coal Field, Esmeralda County, Nevada. J. H. Hance. U. S. Geol. Sur., Bull. 531, 1913; 9 pp., illus.

HOISTING AND HAULAGE

Methods of Haulage in Coal Mines. J. Shanks. Can. Min. Inst. Bull. No. 23; 14 pp., illus.

Types of Electric Winding Engines. L. F. Mitten. Coal Age, Mar. 7, 1914; 4¼ pp., illus. 10c.

The Carron Haulage Gears. (The two illustrations show an endless rope haulage gear, which can be separated into two haulages and worked independently if desired, and a belt-driven double endless rope haulage.) Coll. Guard., Feb. 13, 1914; ½ p., illus. 40c.

The Care of Wire Rope. Employees' Mag., January, 1914; 1¾ pp., illus.

LEGAL REFERENCES

Mining Royalties Dependent Upon Existence of Coal. A. L. H. Street. Coal Age, Mar. 7, 1914; 1 p. 10c.

Must a Contract to Sell Coal Be in Writing? A. L. H. Street. Coal Age, Feb. 7, 1914; 1 p. 10c.

Reasons for Opposing Anthracite Tax. Coal Age, Mar. 7, 1914; ¾ p. 10c.

LIGHTING

Design and Maintenance of Miners' Electric Lamps. (Paper by F. J. Turquand read before the London Branch of the A. M. E. E.) Iron Coal Tr. Rev., Feb. 20, 1914; 3 pp., illus. 40c.

The "Stach" Electric Safety Lamp. (A carrying-hoop is so attached to this lamp that it may be suspended in any position; an alternative construction allows it to swing some 45 deg. in either direction.) Iron Coal Tr. Rev., Feb. 27, 1914; ⅞ p., illus. 40c.

MINE FIRES

Notes on Gob Fires and Blackdamp. (Abstract of paper by John Morris read before the North of England Inst. of Min. & Mech. Engrs.) Iron Coal Tr. Rev., Feb. 20, 1914; 1⅞ pp., illus. 40c.

The Burning of Coal Beds in Place Alexander Bowie. Bull. A. I. M. E., February, 1914; 9½ pp.

Spontaneous Combustion of Coal in Mines. (First report of the Departmental Committee.) Coll. Guard., Jan. 30, 1914; 1¼ pp. 40c.

MINE GASES, TESTING

Influence of Methane in Mine Air. (Translated from Zeit. f. d. B. H. Salinen.) Coal & Coke Op., Feb. 5, 1914; 1 p. 20c.

The Inflammable Gases in Mine Air. George A. Burrell and Frank M. Seibert. Bureau of Mines, Tech. Paper 39; 20 pp., illus.

PREPARATION

Adjusting Ohio Tipples to Conform to New Law. Black Diamond, Feb. 14, 1914; ¾ p., illus. 20c.

Automatic Chute Stop. Coll. Engr., March, 1914; ¼ p., illus. 35c.

Black Diamond Concrete Tipple. (Description of an Ohio coal mine, methods of mining employed and a remarkable tipple.) W. G. Burroughs. Coll. Engr., March, 1914; 3¼ pp., illus. 35c.

RESCUE, SAFETY APPARATUS

Kingston Coal Company's Hospital. Coll. Engr., March, 1914; 1 p., illus. 35c.

Safety Priming Device. Wm. W. Jones. Eng. & Min. Jour., Feb. 21, 1914; 1 p., illus. 25c.

Safety in West Virginia. Frank H. Kneeland. Coal Age, Feb. 7 and 21, 1914; 8¾ pp., illus. 20c.

The Use of Rescue Apparatus in Mines. (Inquiry conducted by Lord Mersey.) Iron Coal Tr. Rev., Feb. 27, 1914; 4½ pp. 40c.

The Present Status of Oxygen Breathing Apparatus. F. W. Gray. Can. Min. Jour., Mar. 1, 1914; 1¼ pp. 25c.

SANITATION, DISEASES

Change House with Novel Features. Eng. & Min. Jour., Mar. 7, 1914; 2¾ pp., illus. 25c.

The Hygienic Aspect of the Coal-Mining Industry. Far-reaching effects of trauma; prevalence of nervous diseases. (Lecture by Dr. Frank Shufflebotham before the Royal College of Physicians.) Coll. Guard, Feb. 27, 1914; ¾ p. 40c.

Welfare Work of the Kingston Coal Co., Coll. Engr., March, 1914; 2 pp., illus. 35c.

STEAM AND GAS ENGINES, BOILERS

Automatically Timed Firing. Power, Feb. 10, 1914; 1½ pp., illus. 15c.

Basis for Determining Coal Values. H. W. Weeks. Black Diamond, Feb. 28, 1914; 1⅞ pp. 20c.

Coöperative Central Station Possibilities. David R. Shearer. Coll. Engr., March, 1914; 1⅞ pp. 35c.

Choice and Care of Grate Bars. Coal Age, Feb. 28, 1914; 1 p., illus. 10c.

Economical Lubrication. (Paper prepared for Lake Superior Min. Inst.) W. W. Davis. Coll. Engr., March, 1914; 2⅞ pp. 35c.

How to Calculate the Losses in Gas Engines. Geo. W. Muench. Power, Feb. 17, 1914; 1¼ pp. 15c.

Improvements in Design in Gas-Engine Construction. (Paper by T. C. Wild read before the Midland Inst. of Min., Civil & Mech. Engrs.) Iron Coal Tr. Rev., Jan. 30, 1914; 1¼ pp. 40c.

Modern Gas-Engine Practice for Collieries. (Paper by A. T. Cocking read before the Midland Inst. of Min., Civil & Mech. Engrs.) Coll. Guard., Jan. 30, 1914; 1 p. 40c.

The Development of the Gas Engine in England and Its Adaptation to the Generation of Power at Collieries and Iron Works. T. C. Wild. Coll. Guard., 2⅞ pp., illus. 40c.

The Cause and Remedy for Clinkers. F. Webster. Power. Feb. 17, 1914; 2 pp. 15c.

The Deterioration of Engines and Boilers. Edward Ingham. Power, Feb. 17, 1914; 1 p. 15c.

The Increasing Use of Powdered Coal. (Editorial) Eng. News, Feb. 19, 1914; 1 p. 25c.

The Use of Pulverized Coal as Fuel. (Paper read by W. S. Quigley at the annual meeting of Amer. Foundrymen's Assn.) Eng. News, Feb. 19, 1914; 1 p. 25c.

Tests of Four-Pass Boiler with Illinois Coal, and Discussion. (Paper read by Bryant Bannister at the second informal dinner of the Chicago section of the A. S. M. E.) Power, Feb. 24, 1914; 2¾ pp., illus. 15c.

TRANSPORTATION

A Simple Coal Elevator and Conveyor Device. Coal Dealer, February, 1914; 2 pp., illus. 20c.

Typical Coal Trestles. Wm. Wallace. Eng. & Min. Jour., Feb. 21, 1914; 1 p., illus. 25c.

Getting Mechanical Handling in Small Plants. Black Diamond, Feb. 28, 1914; ¾ p., illus. 20c.

Loading Conditions of Anthracite Coal at Buffalo. Black Diamond, Feb. 28, 1914; 1 p., illus. 20c.

TIMBERING, PACKING, ETC.

Hydraulic Mine Filling; Its Use in the Pennsylvania Anthracite Fields. (A preliminary report.) Charles Enzian. Bureau of Mines, Bull. 60; 67 pp., illus.

Methods of Driving Pillars in Pitching Seams. J. Somerville Quigley. Can. Min. Inst. Bull. No. 23; 8 pp., illus.

What Shall We Use for Roof Support? A. W. Hesse. Coal Age, Feb. 28, 1914; 1½ pp. 10c.

VENTILATION

Air-Crossings and Their Construction. Ernest Watts. Min. Eng., February, 1914; 2½ pp., illus. 40c.

Connecting Motors to Mine Fans. H. J. Booker. Coal Age, Feb. 7, 1914; 1 p., illus. 10c.

Reversing the Ventilation. (The Keith Mine Fan.) Coll. Guard., Feb. 6, 1914; 1 p., illus. 40c.

Some Experiences in Reversing the Main Air Currents in Coal Mines, and Discussion. (Paper by Wm. Clifford read before the Manchester Geol. & Min. Soc.) Coll. Guard., Feb. 13, 1914; ⅜ p. 40c.

Testing of Ventilating Fans. (Paper by A. J. Kennedy before the Kent Branch of Natl. Assn. of Coll. Mgrs.) Iron Coal Tr. Rev., Feb. 27, 1914; ½ p. 40c.

WORKING OF MINERALS

Mining Methods in the Bering River Coal Field, Alaska. W. R. Crane. Min. & Sci. Press, Feb. 21, 1914; 5 pp., illus. 20c.

The Stripping of Anthracite. E. G. Lewis. Coal Age, Feb. 14, 1914; 2 pp., illus. 10c.

The Disk Coal Cutter. Charles Frobisher. Min. Eng., February, 1914; 4 pp., illus. 40c.